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THE SHAKER WASHING MACHINE.

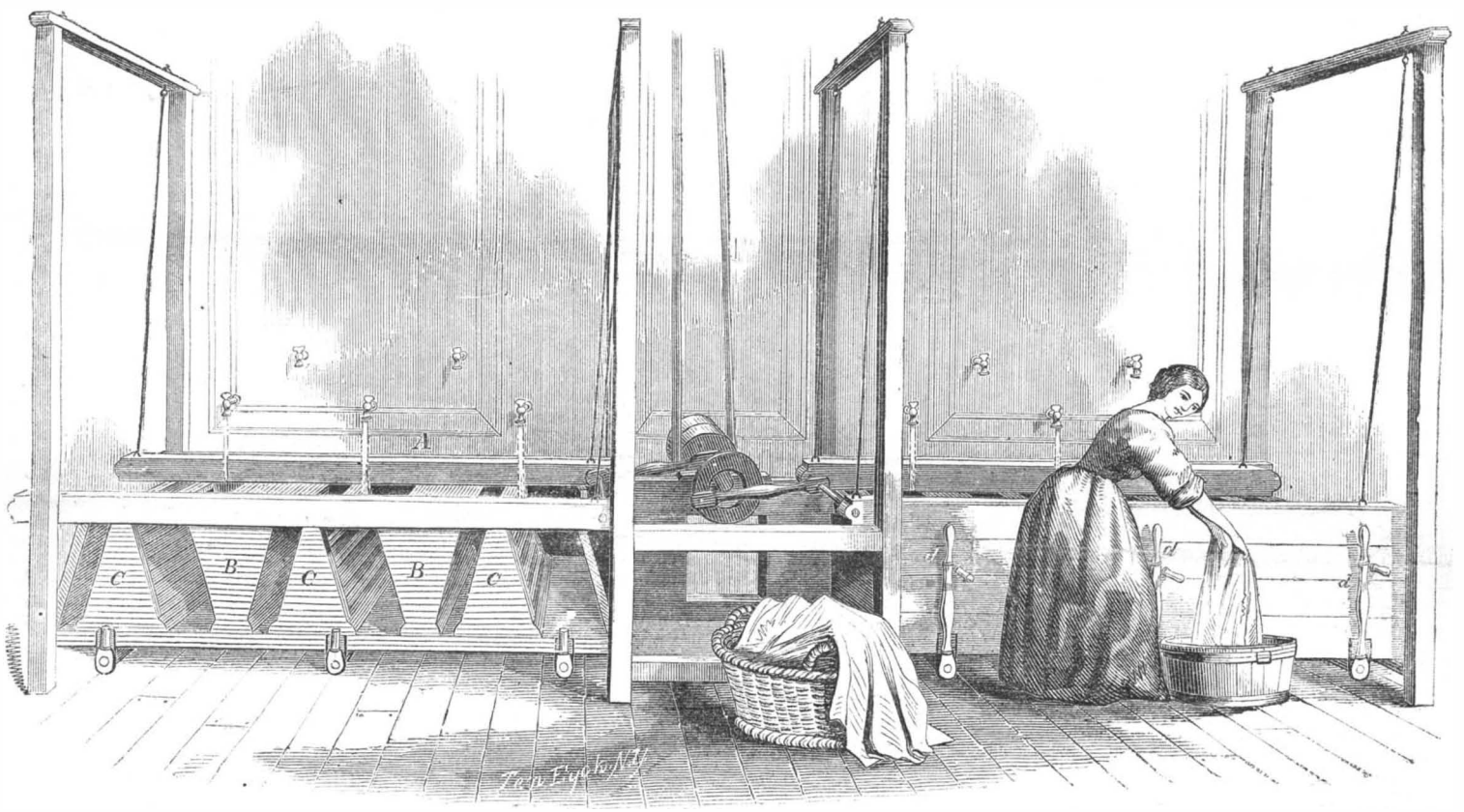
We have long known that the true way to wash clothes is to alternately fill them with soap suds, and squeeze the liquid out by simple compression, avoiding all friction or rubbing as much as possible. This principle is adopted in the machine which we here illustrate.

The two halves of the machine are precisely alike, but in the cut the half at the left hand is shown with the front side removed, in order that that the interior may be seen. A long tank or tub, A, is made 3½ feet in width, with water-tight partitions, B B, which are wider at the top than at the bottom; thus constituting a series of tubs, the ends of which slope inward at the top. In each partition is suspended from a swinging frame one of the pressers, C C C, formed of a series of slats running across the tub with open spaces between them. The clothes and suds or water are put into the tubs on each side of the presses, and a reciprocating motion being given to the swinging frame, each presser is forced alternately near each end of the tub in which it is suspended, squeezing the water from the clothes, which then passes through the slats.

This operation dissolves the dirt, and brings it out with the least possible wear to the fabric; and the frame being suspended, the friction is reduced to the lowest point. Each compartment is supplied with a suitable stop-cock for drawing off the water, the handles, *d d d*, of these stop-cocks rising by the side of the tub in a position convenient for the operator. Different kinds of clothes can, of course, be placed in separate compartments, and thus washed separately at the same time.

This machine has been in use several months in the first hotels in the country, where it gives perfect satisfaction. It is recommended in unqualified terms by the proprietors of the Revere House, Boston; of the St. Nicholas, New York; of the Girard House, Philadelphia; of Willard's Hotel, Washington; of the Tremont House, Boston, and by the managers of numerous large benevolent and manufacturing establishments throughout the land.

The patent for this invention was obtained Jan. 26, 1858, and persons desiring further information in relation to it will please address either the inventor, David Parker, or Robert Shepard, at Shaker Village, N. H.



THE SHAKER WASHING MACHINE.

THE HOOSICK TUNNEL.

The great undertaking of boring through the Hoosick Mountain, for the Troy (N. Y.) and Greenfield (Mass.) Railroad, has progressed favorably during the past year. The whole length of the tunnel to be constructed is about 25,500 feet. The greatest hight of the mountain above the grade line of the tunnel is 1,750 feet. About 2,100 feet have been excavated—on the eastern side about 1,500 feet, the balance on the western. The work of tunneling was commenced in 1856, and has been prosecuted until now, with many delays and suspensions, owing to the want of sufficient capital, the contractors having been compelled to find all the capital and do all the work, up to the time of the first payment of the State on account of the two million loan (October, 1858), when an installment of $100,000 was paid. The tunnel passes through the base of the mountain and connects the valleys of the Deerfield and Hoosick rivers, and forms part of the shortest practicable route between Boston and Troy, N. Y. The whole road between these two cities is completed, with the exception of the tunnel and about twenty miles east of the tunnel along the valley of the Deerfield. The entire length of the road is 186 miles. The maximum grade from east to west is 39.6 feet per mile.

The work of tunneling is prosecuted by first driving an advanced gallery or heading, 14 feet wide and 6 feet high. This is driven day and night (Sundays excepted) by three gangs of workmen, each working eight hours. The gangs consist each of nine men, with the addition of blacksmiths, &c. The progress, under favorable circumstances, is three feet per day. Not more than four holes can be drilled at one time, and the rock is removed by blasting. For the purpose of ventilation, air is forced in through canvas hose, the current being produced by a small fan worked by horse power. The tunnel is designed for a single track, and will be 14 feet wide and 18 feet high. As far as it has progressed, the tunnel is nearly free from water.

Hitherto all the work has been done by hard manual labor, although considerable was said, when the tunnel was commenced, about employing Wilsons' stone-cutting machine for boring the big hole right through the rock. A machine of this kind, we believe, was constructed with this object in view; but what became of it we never heard. It is now proposed to introduce a machine of a different character; one that will contain a certain number of drills attached to small cylinders, to be operated by compressed air, driven from the outside through a tube. This method has been practiced for several years (as described in a former volume of the SCIENTIFIC AMERICAN), in the celebrated Mount Cenis tunnel, in the Alps. The American machine is stated to be superior in its mode of operation, and it is expected that when it gets to work, it will be able to do about seven times the amount of work per day that is done at present. About twenty drills will then be enabled to operate; the blasting will be done with powder ignited by an electric spark; and the foul air is to be exhausted by means of a fan. Col. H. Haupt, the well-known author and engineer, is the present contractor and engineer of this tunnel; when finished, it will be the greatest work of the kind on th continent.

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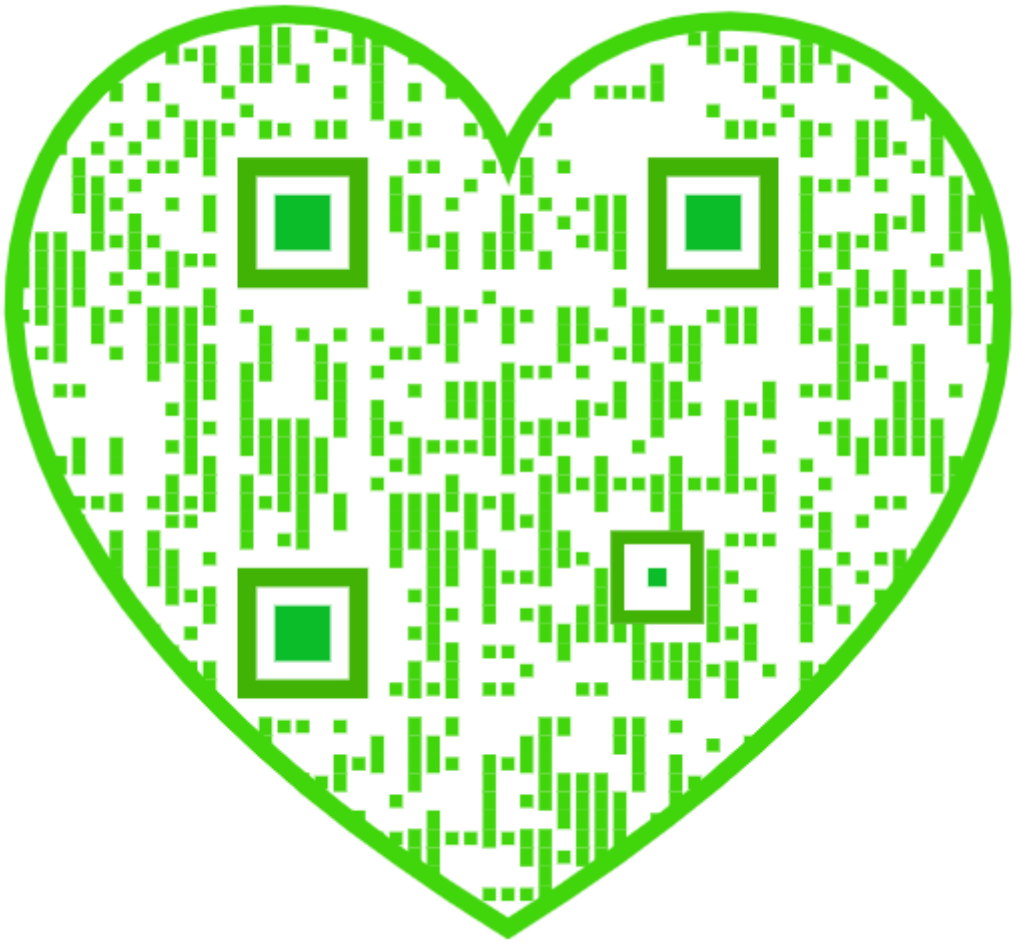

A PRACTICAL INQUIRY INTO THE CAUSE OF THE FALL OF THE PEMBERTON MILL.

[Prepared expressly for the Scientific American.]

The cause of the fall of the Pemberton Mill has excited considerable speculation by some at a distance from the scene of the disaster, who are not well or correctly informed with all the details of facts in connection with the construction of the mill. I therefore propose to state some things which seem to be important facts concerning the cast iron pillars or columns and pintles, and their calculated strength, which are not generally known, and do not appear in the evidence before the coroner's jury.

Having lived in Lawrence for nearly ten years, and been employed the most of that time in designing and planning the construction of machinery for different mills, the construction of a cotton mill, with all its various calculations for the machinery, has been a familiar study. The reader may therefore rely that what is stated is from facts known to myself, or well-established facts from the experience of others.

The part of the mill that fell before the fire, it is well known, was 284 feet long and 84 feet wide from outside to outside. The hight of the mill from top of lowest floor to top of attic floor was 53 feet; to the top of wall 63 feet above the lowest floor; being five stories high, having a low roof supported by pillars from the foundation. The hollow cast iron pillars or columns which supported the flooring and timbers were 10 feet from center to center measuring lengthwise of the mill; being two rows of pillars, 27 in each row, and 26 feet 10 inches from center to center, measuring crosswise of the mill, and about 26 feet 3 inches from the pillars to the pilasters in the lower stories; each pillar supporting an area of 26 feet 6½ inches by 10 feet. The side walls of the lower story, as measured in many places, averaged 19½ inches thick between the pilasters, with a 4-inch vault in the centre; the pilasters were 2 feet 10 inches in width, and projected into the mill 8 inches. The width of the spaces in the walls for windows were 5 feet 2 inches; the width of wall between the windows 4 feet 10 inches. On the west side, at the northwest corner, was an L, 37 feet by 60, six stories high; and at about the middle of the length of the mill, on the westerly side, was a tower, built out and up to the eaves of the mill, used for sink-rooms, &c. On the east side were no towers or projections outside of the mill, which accounts for the building inclining that way as it fell; falling about 35 feet toward the east. It seems that the walls would have been much stiffer, if projections of this kind had been built out on the east side, which is a general custom. It has been stated in support of the stability of the walls that there was very little motion of the mill. The steadiness or rocking of a mill depends more on the location of the looms and speed of the lathes than the thickness and stability of the walls. It takes a certain time for the walls of a mill to move from their perpendicular and return to their original position. It cannot be done rapidly. If the looms were in the upper stories, and the lathes beat quickly, or run more slowly, but of different speeds, the vibration of the mill would be very much less than when the lathes beat nearly together, and slow enough to take the motion of the mill with them. But in the Pemberton Mill the looms were on the lower stories, and *could not* cause any motion of the mill. The beams which supported the floors in the lower stories were of northern pine, 7 by 16 inches, trussed with two iron rods; two of these beams were put together with three-fourths of an inch space between them, making a beam 16 by 14 inches, instead of 16 inches square, as has been stated. These beams butted together at the pillars (not locked in the usual way), and were secured together by two joint bolts seven-eighths of an inch in diameter, one into the two ends of the butting timbers, extending in 9 inches and 3½ inches from the top, a rather inadequate fastening, and would bear comparatively but little strain. The timbers were secured to the walls by wrought iron pieces 1¾ by ¾ inches, fastened between the beams by a bolt, and extending into the wall, turned a right angle, and extended up 9 inches. This does not bind the whole thickness of the wall to the timbers so perfectly as a bolt which passes through the wall, with a nut and washer upon the outside, as is common.

These beams were butted together at each pillar, and did not extend across one pilar, and connect at the other as some have supposed, and which would have been a much safer way. If a pillar had given away where the timbers were whole that crossed it, the whole timbers above would probably have sustained the weight above them, and these timbers, if arranged so as to "break joints," the breaking of any one pillar would not cause the destruction of the whole building, providing the next pillars were strong enough to sustain the increased pressure.

In this way the timbers would cross any vertical line of pillars, whole, in every other story, and be in condition to bear the weight above them. A heavy gear wheel some time since fell against one of the pillars, 8 inches in diameter, in the basement story of the Lawrence Machine Shop, where the timbers were arranged as last described. The shop was then well stocked with heavy tools. The column broke in two and fell down, but the beams sustained the weight above and no further damage was done.

In the case where the beams butted together, as in the Pemberton Mill, and a pillar broke, *nothing* supported the weight above, except the flooring which, of course, was not sufficient, and the structure fell.

The spruce floor planking was 2¾ inches thick; soft pine casing ⅞ of an thick; and double flooring of hard pine 2¼ inches thick, 1⅛ inches each. The pillars in the lower story were 6 inches in diameter at bottom and 5 inches near the top, and designed to be ⅝ inches thick; the middle or breaking part 5½ inches in diameter.

I measured several pillars that were broken by the fall of the building near the middle, and found the above pillars 3-16ths to 3-8ths of an inch thick on one side, and 1⅛ to ⅞ of an inch thick on the other; and their length 12½ feet. On the top of this pillar, and cast separate from it, rested a plate 12 inches in diameter and 1½ inches thick; on this plate rested the timbers with a hole cut out for the pintle, which was 3 inches in diameter, and extended up 16¾ inches, to a flange 7 inches in diameter and 1⅛ inches thick, cast with the pintle; on this flange rested the column above.

A distinguished engineer, before the coroner's jury, gave the breaking weight, according to Hodgkinson's rule, for a pillar 6 inches in diameter at bottom, 5¾ at top, ⅝ of an inch thick and 12 feet long, 221 tuns; in which calculation he is correct for a pillar of those dimensions, with flat ends firmly fitted at top and bottom, as Hodgkinson describes. But that size and length of pillar does not come in, in this case; nor any others for which the gentleman gave the breaking weight. He gave the breaking weight for pillars of the given dimensions, which he calculated for another mill, as analogous to those of the Pemberton Mill; but the dimensions of the pillars materially differ. It is a little singular that he was not requested to calculate the strength of the pillars under investigation; but it does not appear that any calculations for the breaking weight of the columns for the Pemberton Mill were before the jury. The largest pillars were in the first story or weave-room, and measured 6 inches in diameter at the base, 5 inches in diameter at the smallest part near the top, 5½ inches in diameter at the middle, 12½ feet long, and their mean thickness ⅝ of an inch. The formula, by the above author, for the breaking weight, is $44.3 \times (5.5^{3.6} - 4.25^{3.6}) \div 12.5^{1.7} = 169$ tuns breaking weight for the largest pillars instead of 221; assuming that the ends were flat and firmly fitted at the top and bottom, which is not always done and was not so in this case. Now, according to Hodgkinson's experiments, pillars will sustain about three times as much weight when firmly fitted with flat ends, with disks or otherwise, than similar pillars with hemispherical ends capable of turning; or when the pressure is applied diagonally to pillars with flat ends. The bottoms of the pillars in this case were turned; but the pintles upon which the pillars rested were not turned or fitted at either end. The lower ends of the pintles (3 inches in diameter) rested on iron washers of the same diameter and ⅛ of an inch thick, and enough of these were put under the pintles to bring the timbers up to the proper hight; the greatest number I noticed under one pintle was five.

The pintles stood upon a base of washers 3 inches in diameter, which amounts to about the same as standing on rounded ends, for which we shall see a different rule is given. The pillars stood on the flanges of the pintles; the rough edges of the tops of the pillars were chipped off, and the plate 12 inches in diameter (not turned) rested on the pillars, and the timbers rested on the plate; many of the pillars were observed to touch at the top and bottom only on a part of their circumference when they were set up; and probably a very few, if any, had a complete bearing at both ends. In fact, they stood upon a sort of "center." It is clear, therefore, that the formula which the author gives for pillars with flat ends, firmly fixed, does not apply in this case. But he gives another rule for pillars with rounded ends and capable of turning, or for those where the pressure is applied diagonally to pillars of flat ends, which, it seems, is the only safe rule to use in the case before us; he uses the co-efficient 13, instead of 44.3. It is as follows:— $13 \times (5.5^{3.6} - 4.25^{3.6}) \div 12.5^{1.7} = 49.6$ tuns, the breaking weight of the largest pillar in the Pemberton Mill. From a number of experiments of long-continued pressure, it appears that it is not safe to load pillars more than ¼ of their breaking weight. The experiments were made where everything was still; but for the pillars of a mill, with their continued jarring and oscillating motion caused by the machinery, though it be ever so little, the above weight is rather large. But the pillars in the second story were less able to sustain the weight on them than those in the first story. I find them 5⅜ inches in diameter at the bottom, 4½ at the small end, 4 15-16ths inches at the middle, with a mean thickness of ⅝ of an inch, and 11½ feet long. We will apply the rule for pillars not firmly fitted at the top and bottom. And $13 \times (4.9375^{3.6} - 3.6875^{3.6}) \div 11.5^{1.7} = 40$ tuns, their breaking weight. The weight they should permanently bear should not exceed 10 tuns; and the weight they sustained, or were liable to sustain (though this room was more heavily loaded than those above), we cannot safely estimate at less than 18 tuns.

The pillars in this second story were more deficient for sustaining the pressure upon them than in any other room; and probably in this room the first pillar broke. It will be remembered that the witnesses testified that some heavy machinery had been moved to a certain part of the mill, and while the men were yet on the spot who moved it, the flooring gave way a few feet from them. All the witnesses from above this room testify to the flooring falling under their feet. But Timothy Dean, who was in the second story, testified that he "heard a noise, and thought the shaft was breaking;" "didn't feel the floor under him give way, and had no doubt the floor above him gave away and broke through first." This would seem the natural course. When the pillar broke, all the timbers, pillars, flooring and roof resting upon it fell at once, bringing more pressure on the pillars next to it (partly by percussion), which before were loaded to nearly their breaking weight, and they gave way.

We next come to the pintles, which are weaker still. Those in the lowest room were 3 inches in diameter; 16¾ inches from bottom to underside of flange; flange 7 inches in diameter, 1⅛ thick, supported pillars 6 inches in diameter. We will calculate the breaking weight for the flange, as that is the weakest part. I shall adopt the same course as for calculating the strength of teeth of wheels; that is, assume that the whole pressure may be brought to bear on one side, or as far out on the flange as the diameter of the pillar will admit. The distance from the bearing edge of the pillar to the neck of the flange is 1½ inches; the width of the breaking section is about 5 inches. Then, by Hodgkinson's rule, we have $(4.5 \times 5 \times 1.125^2 \times 467) \div 0.2 = 66{,}512$ lbs., or about 33 tuns, breaking weight of pintle.

Now it is generally admitted, and is proved from experiments, that ⅓ of the breaking weight is as far as it is safe to load a beam in practice; about 11 tuns then is all these pintles should have permanently borne; when the weight liable to come on them was 25 tuns. This appears to me to be the weakest point that has been discovered about the mill. If one of the pintlets in the lower story gave way first, it would let the weight upon it fall some 2 or 3 inches, the shock of this fall upon the pillar in the second story, loaded already to nearly its breaking weight if perfect, broke it, and with it the whole structure fell as a matter of course.

It appears from experiments which have been made, that any moderate eccentricity of metal, thicker on one side than the other, does not so much effect the breaking weight of a hollow pillar as one might suppose.

Hodgkinson proved from his experiments that it requires about 6½ to 7 times the weight to crush cast iron that it does to pull it asunder; and as a pillar is bent by pressure when put to its ultimate strain, the thin side tends to crush, and the thick side to break or pull asunder.

And in the experiments on which the above rules for strength of pillars were based, the thickness of opposite sides varied in the ratio of about 1 to 4, 7 to 9.

But the inequality of metal in many of the pillars of the Pemberton Mill is an extreme case, and there is no doubt that their strength was somewhat impaired from this cause.

Since the disaster I have examined the thickness of several pillars in the mills at Lawrence and find but little variation; the greatest not exceeding 3-16ths of an inch. They were cast in Lawrence.

Many pillars of the Pemberton Mill were broken a little above the middle of their length—about 6-10ths to 7-10ths of their length, measuring from the bottom. Take one, for instance, that measured 5⅜ inches in diameter at the bottom, 4½ at small part near the top, and 11½ feet long; it broke 7½ feet from the large end, where the diameter was 4¾ inches; thickness at place of fracture ⅜ of an inch on one side and 13-16ths on the other. This adds new evidence that when we make pillars tapering we sacrifice strength to imaginary beauty. The fashion arose probably from wood pillars which are found in the tree tapering.

But it seems if we would use iron to the best economy for strength, the pillars should be largest in the middle or at least straight.

O. B. M.

Lawrence, Mass., Feb. 20, 1860.

ANOTHER LUCKY INVENTOR.—A. Hammond, of Jacksonville, Ill., (whose invention of a mole plow we illustrated on page 136 of our present volume) writes us, under date of Feb. 25 as follows:—"The reason I have not written you before is owing to my absence from home for the past six weeks, selling territorial rights on my plow. My sales averaged about $600 per day."

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ARRANGING COMPASSES TO PREVENT ATTRACTION.

When Capt. R. F. Finlay, in 1853, was selected to pilot the United States frigate *Mississippi*, with Commodore Perry, to the banks of Newfoundland (on the fisheries dispute), that fine ship had five compasses, all of which differed. The commodore, in knocking about in such a foggy climate along shore, was distrustful of her compasses, so Capt. Finlay suggested a plan for their correction. The commodore at once gave orders to place everything needed at his command, whereupon the captain ordered the armorer to make an iron ring with a flange upon it, and this he secured to the upper part of the basin of the compasses. This counteracted the local attraction and the compasses worked well. "Who taught you to do that?" asked the commodore. "No one," said Capt. Finlay, "but I remember being on board of an Irish sloop, where the compass failed to work properly, owing to the chain-locker being close by. Her captain took it out, placed it in a bucket of pitch situated below the iron, when the compass then performed its natural functions. This suggested to me the idea of the iron ring."—*Mitchell's Steam Shipping Journal.*

[If this statement is not correct it can easily be contradicted by those who were on board of the *Mississippi* on that occasion. If true, it is a strange coincidence of an invention made about the same time, we believe, by two persons situated hundreds of miles distant from each other; we mean the iron ring of Mr. Calvin Kline, of this city, for obviating local attraction, and which was secured by Letters Patent several years ago. It was discovered afterwards that it was not a perfect corrector of local attraction; but the same inventor, by a subsequent arrangement of a battery of magnets near the needle, has rendered the correction of compasses perfectly reliable.

From the defective operation of the compasses of the frigate *Mississippi*, and the recent wrecks of two iron steamers, the *Indian* and *Hungarian*, on the coast of Nova Scotia, in all probability there may be causes which induce strong local attraction of the magnet in these seas. The powerful and well-known currents which exist on the coast or the projecting headlands may exert a strong magnetic influence and account for those catastrophes. This is a subject which is well worthy of further investigation by those engaged on our "Coast Survey," and by Lieut. Maury, at Washington. As the safety of every ship depends upon the quiver of the little magnetic needle, too much attention cannot be bestowed upon rendering its action reliable under all circumstances.

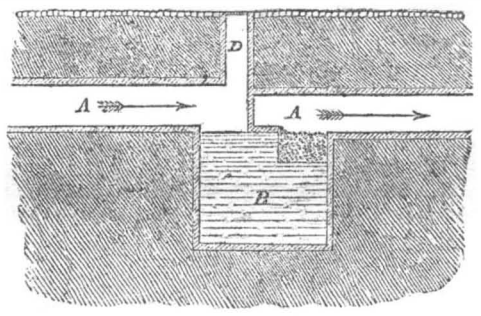
IRON FENCES.

Some 15 years ago, nearly all the iron fences which were constructed were made of wrought iron fashioned at the blacksmith's forge. This process was, of course, enormously expensive, and consequently caused a very limited demand for the article. The introduction of cast iron reduced the expense, and resulted in a considerably-increased demand. This material made a more ornamental fence, and one which, in appearance, was more substantial; but it was, of course, in reality much more liable to be broken than a fence made of wrought iron.

In 1849, the manufacture of wire fence and railing was commenced on a large scale in this city by Messrs. Hutchinson & Wickersham, No. 312 Broadway, whose works, it will be remembered, we described very fully about a year ago. The operations of this firm have since increased very largely, and we are now furnished with a striking evidence of the extent and prosperity of their business by the publication of a very costly catalogue of their articles, illustrated by neat and elegant lithograph engravings, which represent a great variety of designs for fences, railings, verandahs, gates, brackets, &c. Some of their railing is made wholly of wrought iron wire or rods, from three-sixteenths to an inch in diameter; some is made of hollow tubes (gas pipe), but most is constructed of a combination of rods with cast iron fastenings and ornaments. This is the celebrated composite iron work for which a patent was granted to Henry Jenkins on January 13, 1852; the patent now being owned by Messrs. Hutchinson & Wickersham. By this plan the wrought iron rods are fastened together at the ends and crossings by ornamental cast iron bands, which are cast around them, making a remarkably cheap, strong and elegant fence. The catalogue of varied designs is distributed gratis among such architects as desire to use the railing.

SEWERAGE OF CITIES.

MESSRS. EDITORS:—Having read with great satisfaction the letter of Professor Liebig in your valuable journal (which I have constantly read for the last 12 years); and having been, for more than 20 years, more or less engaged in the laying out and construction of sewers, I fully concur with him in all that he says of the importance of the subject, with regard to the saving of those hitherto lost substances by which we may renovate our impoverished lands. I have oftentimes brought the subject before my own and some neighboring cities, but without any success. What the learned professor says of the older countries is already beginning to be true even here. My first suggestion of a plan to save the sewerage of cities would be to sink vaults under the bottom of all lateral and inlet sewers before they reach the main receiving sewers that carry off the larger bodies of water from the streets. Into these vaults all the matter from the blocks must flow with the water that carries it; out of these vaults the water should flow through an inverted filterer leaving all that is valuable in the vaults, so that nothing but nearly clear water would reach the main sewers; consequently, no nuisances would be created at these outlets. And as all matter in the vaults would be always covered with water, there would be no nuisance from them. How far chemical agents in the vaults and filterers could be made to assist in retaining and improving all the valuable matter retained would be a subject of experiment. Could such a system be carried out in the city of London (and I can see no impossibility in it), the river Thames would present quite a different appearance from what it sometimes does now. In the



accompanying diagram let A A be the sewer, B the vault leading through the filterer, as shown by the arrows, and D the manhole in the street through which the vault should be emptied, by pumping or otherwise; and as cheap disinfectants are known, there need be no nuisance from the emptying of the vaults. In those cities that are already sewered on the present plan of wasting, everything would have to undergo some alteration in the arrangement of the inlet sewers in those streets, in order to affect the proposed saving; but in most other streets, by a slight modification of the present sewers and some alterations in the disposal of the surface water, the object may be attained with the addition of these vaults. H. L.

Buffalo, N. Y., March 1, 1860.

SHAKER PLAN OF MAKING SOAP.—The trustees of Shaker Village, N. H., give us the following easy and cheap method of making soft soap:—"Place a shallow iron kettle, to hold from 4 to 6 barrels, just out of the wash-room, under cover of a shed. Extend half or three-quarters inch pipe for steam to the middle of the bottom, bending it to form of surface, and terminating with open end. Take another pipe to discharge cold water over the top of the kettle. Use the best quality of 'first sorts' of potash in the proportion of 6 pounds of potash to 7 pounds of grease, for a barrel of 40 gallons. Break up the potash into small lumps, and dissolve it in, say, 2 pails of hot water to 24 pounds. It dissolves rather slowly when the potash is good. When dissolved, put the solution into the kettle, and add the grease quite warm, and stir the mixture together. Allow it to stand over night, if convenient. In the morning, apply a moderate jet of steam until the mixture appears ropy, or rather, *soapy*. Shut off the steam and open the cold water valve, stirring the mixture, as the water runs, until the kettle is full, or the required quantity obtained for the materials used. My man makes an excellent article, and never fails. The materials for 40 gallons of soap cost, at present prices, 64 cents; the labor nothing, as the man is not hindered by making it."

SIGNS OF THE TIMES.

Dr. Cumming, the famous Scotch preacher of London, has recently stated in a public lecture at Leeds (England) his opinions respecting the great events which, according to his interpretation of the book of Daniel and the Apocalypse, are looming in the future. He said the year 1867 seemed to end 6,000 years of the world's history, and from the earliest periods onward it had been the almost universal belief that the six days of creation were typical of those 6,000 years, and that the seventh day of creation, or the Sabbath, was typical of the millennial rest of 1,000 years. But they would say that, supposing this were so, they were at this moment over 140 years short of the 6,000 years. It was a remarkable fact, however, that the ablest chronologists, irrespective of all prophetic theories, had shown that a mistake of upwards of 100 years had been made in calculating the chronology of the world, and that the year 1860 of the Christian era began not from the year 4004 of the world's history, but in the year 4138, and that the year of Christ's birth was five years before that, or in 4132. If his premises were just, then they were at that moment within seven years of the exhaustion of the 6,000 years; so that if 1867 were to be the termination of this economy, they had arrived at the Saturday evening of the world's long and dreary week. If this were so, it was a magnificent thought that there were some in that assembly who would never die. They were just plunging into the days such as they had never before seen; an European war was looming more dreadful than that through which they had recently passed, and when these things happened it would be seen that the sentiments he had uttered were not the dreams of fanaticism, but the words of soberness and truth.

Messrs. Rudd & Carlton, of this city, have published, quite recently, two volumes of lectures by Dr. Cumming, entitled "The Great Tribulation." They are among the most interesting religious publications extant; and however widely we may differ from the learned doctor, in some of his views, yet we cannot but admire the eloquence and piety which these lectures exhibit.

THE IMPERIAL CYCLOPÆDIA OF MACHINERY.—We acknowledge the reception of the last 11 numbers of the "Imperial Cyclopædia of Machinery," from the hands of Messrs. C. B. Russell & Bros., of No. 12 Tremont-street, Boston, the American agents of Mr. W. Mackenzie, of Glasgow, the publisher. The above-named work has been produced in a style of truly "imperial" magnificence, and comprises a series of plans, sections and elevations of stationary, marine and locomotive engines, spinning machinery, grinding mills, tools, &c., all of the newest and most approved construction, and many of them only recently patented; also several of the most useful and important machines that were exhibited at the World's Fair of 1851; the illustrations being accompanied by full descriptive letter-press, an essay on the Steam Engine, a history of the Railways in Great Britain and America, a dissertation on Screw Propellers, and a treatise on a new method of Perspective, applicable to the delineation of complicated machinery and designed to obviate, in a great degree, the necessity of making expensive models. The illustrations are drawn on a scale large enough for the practical mechanic to *work* from; and being got up under the superintendence of eminent practical engineers, their fidelity in every detail can be relied on. We earnestly recommend this elaborate and comparatively cheap work, as a standard of excellence, peculiarly adapted to preserve and foster the spirit of progress among the thousands of our readers who are engaged in the practical application of the principles involved in the science of Constructive Mechanics.

CANADIAN PATENT LAW.—Some of our cotemporaries are erroneously publishing that a new patent law has passed the Canadian Parliament, and that there is now a chance for American inventors to secure patents in those Provinces. Probably this announcement it made upon the review of the Canadian patent bill, as published by us on page 89 of the present volume of the SCIENTIFIC AMERICAN. The bill has not yet become a law, but in anticipation of its early passage, we have our arrangements nearly perfected for prosecuting patents in the Canadas; meanwhile, inventors and patentees should look to our columns for the earliest and most reliable information on the subject, as we are in direct correspondence with the committee.

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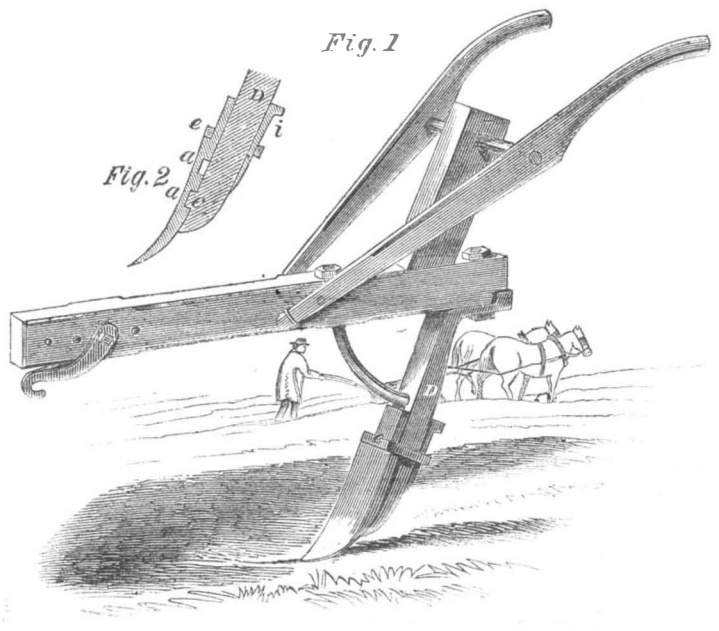
IMPROVED SHOVEL PLOW.

We have tried many kinds of implements for cultivating corn, and we have never found anything superior to the shovel plow. Awkward and clumsy as it may appear, it kills the weeds more effectually, and thus makes the plants grow better, than any of the more elegant cultivators we have tried, although vast improvements have been made in the cultivator since we left the field. One of the principal difficulties with it has been the fastening of the shovel or share to the foot, an operation effected by the plan here illustrated in the simplest and most substantial manner.

The general construction of the plow is so clearly shown in the perspective as to require no description. The mode of fastening the share is illustrated in Fig. 2. In the lower or back side of the share, a series of circular recesses, *a a*, are formed, into any one of which the pin, *c*, enters; this pin being rigidly secured to the foot, D. A band, *e*, surrounds the foot and the shank of the share, and is tightened by the wedge, *i*. By fitting the pin to any recess in the share its depth in the ground may be adjusted at pleasure.

Another feature in this improvement is the shackle, which consists simply of a hook with a forked end which grasps the beam. A number of holes for fastening the shackle to the beam are made in a line along the beam, and the line of draft and consequent depth of plowing may be adjusted at pleasure by passing the shackle pin through any one of these holes.

Fig. 1



LEE'S IMPROVED SHOVEL PLOW.

The patent for this invention was obtained through the Scientific American Patent Agency, Oct. 4, 1859, and persons desiring further information in relation to it will please address the inventors, E. D. & Z. W. Lee, at Blakely, Early county, Ga.

LAYING OUT ORCHARDS

We have found the setting of trees in orchards so that they would stand exactly in rows both ways, a more difficult problem than deflecting a regular curve for a railroad line between two tangents, or any of the ordinary operations of civil engineering. After trying various modes of *ranging* we have finally discovered that the simple method of measuring is not only by far the most rapid, but also the most accurate of any plan that we have ever tried. Since we adopted this method, we have set two and a half acres in small peach trees with such precision that no tree in the orchard stood out from the line to the extent of its semi-diameter, that is to say, to the extent of half an inch, and we do not believe that we expended one quarter the time in getting the trees in line that is ordinarily bestowed in the system of ranging. For such accuracy the measurements must of course be made with great exactness, and this can only be done by means of a rod and small pins.

The best thing for a rod is a cane fish pole, though a slender white pine sapling is nearly as good, cut green and seasoned under cover if there is time, if not selected from among the dead trees found standing in the woods. The essential points are to have the rod straight and stiff, with one end small in order that it may be light. Cut the rod of a length corresponding to the distance apart which it is desired to place the trees, and provide a basket full of straight pins about 10 inches long, cut from twigs about $\frac{1}{4}$ of an inch in diameter. Now draw a line of stout twine the whole length of the field along one side, at the proper distance from the fence for the first row of trees, and measure along the line, inserting a pin into the ground at each space. For this measuring two persons are required, one of whom holds the butt end of the rod exactly at the middle of the last pin inserted, and the other puts a new pin into the earth at the small end of the rod. Measure entirely around the field in this way, and if necessary move the last two lines until the measurement comes correctly at the place of beginning. Then draw the line and measure across the field successively for each row, putting in a pin for each tree. The person who inserts the pins should place himself first at right angles to the line to be sure to get the pin opposite the end of the rod, and he should then stand astride of the line and move the pin if necessary to get it perpendicular, with one side just in contact with the line.

The holes should be dug all one side, for instance the east side of the pins, in order to leave the pins in place for use in setting the trees. This is easily done by placing the first pin at the beginning along the line 21 inches farther from the edge of the field than it is desired to have the trees, which of course operates to place the pins in a corresponding position. Let the nearer edge of the hole be six inches from the pin and this will bring the middle of the hole, if it is $2\frac{1}{2}$ feet square, 21 inches from the pin. Provide a small straight rod 21 inches in length, and in setting the trees measure with this rod from the pin, to find the place in the hole for the tree.

The opposite angles of the orchard must be equal, that is the orchard must be either rectangular or rhomboidal, in order to have the measurements meet at the place of beginning. If it is desired to have the rows at right angles to each other, and no compass or goniometer is at hand, a right angle may be laid off by measuring 8 feet on one line, and 6 feet on the cross line, and moving the latter till the hypothenuse measures 10 feet. Or better, still, by constructing an isosceles triangle. Stretch the base line both sides of the corner pin and measure along it each way 10 feet marking the points. Then from these points lay two poles of equal length, say 15 or 20 feet long, with their opposite ends together and set a pin at the angle; this pin will be at right angles to the base line starting from the corner.

In stretching the line, secure one end by driving the stake to which it is attached into the ground, and taking hold of the opposite end, pull it about as hard as the twine will bear, at the same time whipping the line up and down, and when it is brought straight secure the end which you hold by pressing its stake also into the earth. Stones or clods should be placed upon the line at intervals to hold it in place during the process of measuring. This method of laying out an orchard may seem to be troublesome, but in practice it will be found to save labor in comparison with the most careless plan, if any attempt whatever was made to have the trees in rows both ways; and it affords a constant source of satisfaction in observing the mathematical straightness of the rows, not only those at right angles, but also those that are formed in every possible diagonal direction.

COMPLETE DESCRIPTION OF THE AURORA BOREALIS AND AURORA AUSTRALIS.

The *American Almanac* for 1860 contains an article on the aurora, by Professor Joseph Lovering of Harvard University, which by its numerous references, displays laborious research and thorough investigation of the subject. Among the numerous facts stated, the most interesting one is that "the crown occurs around that point of the sky to which a perfectly free magnetized needle points." After a very elaborate discussion of the periodicity of the aurora, Professor Lovering comes to the following conclusions:—"There is a *secular* periodicity, consisting of 20 years or more of abundant exhibitions, separated by intervals, equally long or longer, when the phenomenon, if not wholly wanting, is unaccompanied by any of its more striking characteristics." It is observed quite as often in summer as in winter. "In regard to the *diurnal* periodicity, the general fact is observable, that, although grand auroras, as that for example of August 28, 1859, may last through the whole night, generally the aurora dies out before midnight; and even the best displays usually attain their maximum before 10 or 11 o'clock." It is seen most frequently in the neighborhood of the magnetic pole. "Scoresby says that in Iceland the aurora may be seen almostevery clear night in winter. Franklin had 142 examples of it in six months in the Arctic Sea." Careful and numerous experiments have been made to determine by the property of polarization whether the light eminates directly from the aurora or is reflected. The point is not absolutely settled, but it is highly probable that the light is not reflected. Professor Lovering's discussion of the question, whether this phenomenon is accompanied by any *sound*, affords a very striking proof of the uncertainty of human testimony resulting from the general carelessness of observation. The impression left upon the mind by the whole mass of conflicting testimony is, that it is not very probable that any noise does accompany the aurora. It is the opinion of Arago that the methods adopted to ascertain the hight of the aurora above the earth are not to be relied on, and that this point is still wholly undetermined. In regard to the character of the *light* the following quotation is made from Singer's Elements of Electricity:—"When electricity passes through rarefied air, it exhibits a diffused luminous stream, which has all the characteristic appearance of the northern lights. There is the same variety of color and intensity, the same undulating motion and occasional corruscations; the streamers exhibit the same diversity of character, at one moment divided in ramifications and at another beaming forth in one body of light, or passing in distinct broad flashes; and when the rarefaction is considerable, various parts of the stream assume that peculiar glowing color which occasionally appears in the atmosphere, and is regarded by the uninformed observer with astonishment and fear."

The article closes with a brief notice of some of the explantions that have been offered. Some may be passed over lightly; such as that of the ex-king of Sweden, who imagined the light was ground out by the friction of the earth on its great axle. Franklin modestly suggested the following:—"May not, then, the great quantity of electricity brought into the polar regions, by the clouds, which are condensed there, and fall in snow, which electricity would enter the earth, but could not penetrate the ice, may it not I say (as a bottle overcharged), break that low atmosphere, and run along in the vacuum over the air towards the equator, diverging as the degrees of longitude enlarge, strongly visible where densest, and becoming less visible as it more diverges; till it finds a passage to the earth in more temperate climates, or is mingled with the upper air? If such an operation of nature were really performed, would it not give all the appearance of an aurora borealis?" Marian and the late Professor D. Olmstead, of Yale College, both believed the origin of the aurora to be in space beyond the boundaries of our earth and its atmosphere, or some nebulous matter which the earth occasionally meets in its flight through space. It is certain, however, that it partakes not only of the motion of the earth about the sun, but also of the rotary motion about its axis.

The conclusion of the whole matter is, that the aurora borealis is so swift and changing in its motions, so distant in its position, and so subtile in its nature, that it baffles investigation, and remains, more than anything else which can be so plainly seen, largely enveloped in mystery. We respectfully suggest to the numerous gentlemen who are concocting theories in regard to this phenomenon, to procure Professor Lovering's article in order to avail themselves of the numerous facts which he has collected. The real masters of science almost always exhibit this labor in collecting facts, combined with a modesty in offering their own theories in explanation of them.

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ABANDONMENT OF INVENTIONS TO THE PUBLIC.

In one sense, patentees are the pets of the law. For fourteen years a prescriptive right to their inventions is freely awarded them; and when, from peculiar circumstances, this fails to be adequately remunerative, they may have a further extension of seven years, But while their rights are thus protected, the law expects from them fair and honest dealings. It will not allow them to first use their invention for five years, and then to apply for a patent. This would, in effect, give the patentee nineteen years instead of fourteen, which is the time that the law has adjudged to be a fair compensation to the inventors for their ingenuity and enterprise; and at the end of this time it imposes upon the patentee the duty of resigning his exclusive claims to the free competition of the public. Nor will the law allow them to first part with their invention, or with the right to use their invention, afterwards secure a patent, and then by injunction restrain the parties to whom they previously gave the right to use it from enjoying that right. It will, however, protect the inventor from any persons who fraudulently attempt to get possession of his invention before he has patented it, and while he is endeavoring to perfect the details of it.

The case of Winser *vs.* Kendall *et al*, recently decided in the United States Supreme Court, illustrates the above points. This was an action for the recovery of damages for an alleged infringement by the defendant of the plaintiff's machine for manufacturing harness. One of the defenses of the defendant was that given by the Act of Congress, passed March 3, 1839, and which reads as follows:—"Every person or corporation who has or shall have purchased or constructed any newly-invented machine, manufacture, or composition of matter, *prior* to the application of the inventor or discoverer for a patent, shall be held to possess the right to use and vend to others to be used, the specific machine, manufacture or composition of matter, so made or purchased, without liability therefor to the inventor, or any other person interested in such invention."

In the support of the above defense evidence was introduced upon the trial, tending to show that the plaintiff constructed a machine in substantial conformity with his specification, as early as 1846, and that in 1849 he had several such machines in operation, on which he made harness to supply all such orders as he could obtain; that he continued to use these machines until he obtained his Letters Patent; that he repeatedly declared to different persons that the machine was so complicated that he preferred not to take a patent but to rely on the difficulty of imitating the machine, and the secrecy in which he kept it. The defendants also gave evidence tending to prove that the first of their machines was completed in the autumn of 1853, and the residue in the autumn of 1854, and that in the course of that Fall the plaintiff had knowledge that the defendants had built, or were building, one or more machines like his invention and did not interpose to prevent them.

The plaintiff gave evidence tending to prove that the first machine built by him was never completed so as to operate; that his second machine was only partially successful, and improvements were made upon it; that in 1849 he began four others and completed them in that year, and made harness upon them, which he sold when he could get orders, that they were subject to some practical difficulties, particularly as it respected the method of making the harness, and the liability of the bobbin to get out of the clutch, that he was employed in devising means to remedy these defects, and did remedy them; that he also endeavored to simplify the machine, by using only one ram shaft; that he constantly intended to take Letters Patent when he should have perfected the machine; that he applied to his attorney for this purpose in February 1853, but the model and specification were not sent to Washington till November, 1854; that he kept the machine from the view of the public, allowed none of the hands employed in the mill to introduce persons to view them, and that the hands pledged themselves not to divulge the invention; that among the hands employed was one Kendall Aldridge, who left the plaintiff's employment in the autumn of 1852, and entered into an arrangement with the defendants to copy the plaintiff's machine for them, and did so, and that it was by Aldridge and under his superintendence, and by means of the knowledge which he had gained while in the plaintiff's employment under a pledge of secrecy, that the defendants' machines were built and put in operation; and that one of the defendants had procured drawings of the plaintiff's machine and had taken out Letters Patent for it in England.

At the Circuit Court the case was decided in favor of the plaintiff; but the defendants (upon exceptions to the charge of the judge) appealed to the Supreme Court. The following is the opinion of that appellate court. (Daniel J.):—"The defense must depend exclusively upon the proper construction of the section of the law above cited, and the application of that section to the conduct of the parties as shown by the bill of exceptions. It is undeniably true that the limited and temporary monopoly granted to inventors was never designed for their exclusive profit or advantage; the benefit to the public or community at large was another and doubtless the primary object in granting and securing that monopoly. This was at once the equivalent given by the public for benefits bestowed by the genius and meditations and skill of individuals, and the incentive to further efforts for the same important objects. The true policy and ends of the patent laws enacted under this government are disclosed in that article of the constitution, the source of all these laws, viz.: "to promote the progress of science and the useful arts"; contemplating and necessarily applying their extension and increasing adaptation to the uses of society. By correct induction from these truths, the inventor who designedly, and with the view of applying it indefinitely and exclusively for his own profit, withholds his invention from the public, comes not within the policy or objects of the constitution or acts of Congress. He does not promote, and if aided in his design, would impede the progress of science and the useful arts. And with a very bad grace could he appeal for favor or protection to that society which, if he had not injured, he certainly had neither benefitted nor intended to benefit. Hence, if, during such a concealment, an invention similar to or identical with his own should be made and patented, or brought into use without a patent, the latter could not be inhibited or restricted, upon proof of its identity with a machine previously invented, and withheld and concealed by the inventor from the public. The rights and interest, whether of the public or of individuals, can never be made to yield to schemes of selfishness or cupidity; moreover, that which is once given to, or is invested in, the public cannot be recalled or taken from them.

But the relation borne to the public by inventors, and the obligations they are bound to fulfill in order to secure protection from the former, and the right to remuneration, by no means forbid a delay requisite for completing an invention, or for a test of its value or success by a series of sufficient and practical experiments; nor do they forbid a discreet and reasonable forbearance to proclaim the theory or operation of a discovery during its progress to completion, and preceding an application for protection in that discovery. The former may be highly advantageous, as tending to the perfecting the invention; the latter may be indispensable, in order to prevent a piracy of the right of the true inventor. It is the unquestionable right of every inventor to confer gratuitously the benefits of his ingenuity upon the public, and this he may do either by express declaration or by conduct equally significant with language—such, for instance, as an acquiescence, with full knowledge in the use of his invention by others; or he may forfeit his rights as an inventor by wilful or negligent postponement of his claims, or by an attempt to withold the benefit of his improvement from the public until a similar or the same improvement should have been made and introduced by others. Whilst the remuneration of genius and useful ingenuity is a duty incumbent upon the public, the rights and welfare of the community must be fairly dealt with and effectually guarded. Considerations of individual emolument can never be permitted to operate to the injury of these. But whilst inventors are bound to diligence and fairness in their dealings with the public, with reference to their discoveries, on the other hand, they are, by obligations equally strong, entitled to protection against frauds or wrongs practiced to pirate from them the results of thought and labor, in which nearly a life-time may have been exhausted—the fruits of more than the *virginli annorum lucubrationes*, which fruits the public are ultimately to gather. The shield of this protection has been constantly interposed between the inventor and the fraudulent spoliator by the courts in England; and most signally and effectually has this been done by this court in the cases of Pennock & Sellers *vs.* Dialogue, and Shaw *vs.* Cooper. The real interests of an inventor with respect to an assertion or surrender of his rights under the constitution and laws of the United States, whether it be sought in his declarations or acts, or in forbearance or neglect to speak or act, is an inquiry or conclusion of fact, and peculiarly within the province of the jury, guided by legal evidence submitted to them at the trial. The instructions from the judge at the Circuit Court in this case we consider to be in strict conformity with the principles hereinbefore propounded, and with the doctrines of this court, as declared in the cases of Pennock & Sellers *vs.* Dialogue, and Shaw *vs.* Cooper. The decision of the Circuit Court is affirmed, therefore, with costs."

DEVELOPMENT OF THE TEETH OF CATTLE, AND MODE OF ASCERTAINING THEIR AGE BY THE SAME.—Persons acquainted with the dentition of "neat stock," can form a pretty accurate idea of age, from the period of birth up to that of adult life; and this method of ascertaining the age of an animal is, probably, more correct than than which applies to *horns;* for, by means of a rasp applied to the rings of the horns, any amount of imposition may be practiced, when it is well known that the same liberties are not to be taken with the teeth, without the chances of discovery. It is possible that there may be some slight variatious from the following rules, in the development of the teeth, yet such variations will not embrace a period of over a month or six weeks, which at maturity does not amount to much, and may be considered as purely accidental—out of the ordinary course of nature. The front teeth or temporary incisors are found in the lower jaw; there are eight of them, all prominent at the age of four weeks. The calf is usually born with three temporary grinders or molars; the fourth appears six months after birth; the fifth appears at the age of fifteen months; and the sixth is to be seen at the age of two and a half years; now, the animal has a "full mouth" of temporary teeth, numbering thirty-two. At this period a very remarkable change in the teeth is about to occur; the temporary ones, having answered the purposes for which they were intended, are to be removed in the following order, so as to give place to others which shall correspond to the increase in the size of the jaw bones, and prove as durable as other bones of the body. At the age of two years the central or middle incisors (lower jaw) are shed and replaced by two permanent ones. At the age of three, the two incisors known as the inner middle undergo the same process. At the age of four, the outer middle are shed, and replaced by permanent teeth. At the age of five, the corner incisors are also transformed in the same manner, and the animal has a full set (eight) of permanent front teeth. The first and second permanent molars known as grinders, appear in the upper and lower jaws on each side, at the age of two years; and at intervals of one year, the other four are successively cut; so that at the age of six years the animal has a full mouth of permanent grinders.—*American Stock Journal.*

GUM-SHELLAC IN PRUNING TREES, AND IN CUTTING-OFF YOUNG TREES IN THE NURSERY.—Young trees which were budded the past season will require to be cut off above the bud this spring. The plan adopted by many nurserymen is to cut the tree an inch or half an inch above the bud, and after the latter has begun to grow, to trim the trunk down to the point of connection with a sharp knife. As the young shoot is exceedingly tender, it is in great danger of being injured by this operation. The necessity for this laborious and objectionable method results from the danger of the buds being killed by the drying of the trunk down from the place at which it is cut. We have practiced for several years, and on many thousands of trees, a plan which saves entirely the second trimming, and which has been fully successful. We trim the tree down close to the bud at the first operation, and paint the surface of the cut with a thick solution of gum-shellac in alcohol. As the gum is not soluble in water it is not washed off by the rains, and it preserves the tree alive to the very end, so that the wound heals in the most perfect manner, making a smoother joint than can be produced in any other way. This preparation may also be used with advantage for coating the wounds made in pruning choice trees.

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POLYTECHNIC ASSOCIATION OF THE AMERICAN INSTITUTE.

[Reported expressly for the Scientific American.]

On Thursday evening, the 23d ult., the usual weekly meeting of the Polytechnic Association was held at its room in the Cooper Institute, this city; the chairman being Professor Cyrus Mason.

MISCELLANEOUS BUSINESS.

Phonetic Alphabet.—Mr. Lewis Masquerier read a paper on phonetic alphabets, presenting the usual arguments of phonography, severely criticising Pitman's system, and proposing a classification of sounds and an alphabet which, according to Mr. Masquerier, are free from objection. Printed specimens of the system were presented to the audience, and the subject was further illustrated by an elegant chart.

Railroad Brakes.—Dr. Reuben read a translation (from the French) of a paper sent in by August Mortara, of No. 114 St. Mark's-place, this city, setting forth the advantages of a system of automatic brakes for railroad cars, to be operated by steam.

The order of the regular subject—"Superheated Steam"—was then called. The following is the resulting

DISCUSSION.

Mr. Robert McCarty—The most economical system of using steam that I have seen was patented by Thomas Craddock, in 1840, and improved in 1846; it has been in successful operation for over 15 years in England. The engine I saw in operation was of 40 horse-power; boiler tubular (3-inch tubes); the steam was carried to a heater in the flue of a chimney, thence to the high pressure cylinder at a pressure of 115 lbs., cut off at 2-64ths of the stroke, exhausted into the low pressure cylinder; and thence to the condenser. High pressure cylinder 10 inches bore; low pressure 18 inches, and 2 feet stroke. Craddock designed to use steam at 200 lbs., and to cut off at 1-64th of the stroke, working the steam at both high and low pressure. The Cornish system is 50 lbs. pressure, cutting off at 4-64ths. The present marine practice in England is 20 lbs., and cut off at ½.

The quantity of water required per day by 40 horse-power engines, is as follows:—Boulton & Watt's engine, gallons, 78,400; Cornish engine, 16,800; non-condensing engine, 4,000; Craddock's, 400.

The annual cost of coal, at 15s. per tun, is as follows:—Engine in which steam is used without expansion, £292; non-condensing engine (steam at 50 lbs., cut off at 2-3ds), £177; condensing engine (steam at 20 lbs., cut off at ½), £170; Cornish engine (steam at 50 lbs., cut off at 4-64ths), £68; Craddock's engine (steam at 100 lbs., cut off at 2-64ths), £39. These calculations have been made in strict accordance with practical results.

Mr. Fisher—Thomas Prosser's boiler is of the upright tubular form, composed of water and flue tubes—water in the annular spaces; 113 feet of surface exposed to water, and 54 feet in the steam room as superheating surface. The average superheating (per report of naval engineers) was 30° when the smoke in the chimney was 40° hotter than the superheated steam. With natural draft, the rate of evaporation was about 3 lbs., per hour per foot of surface—one-fifth of what is obtained in some locomotives. Had the fire been forced, the degree of superheating would have been higher, for the reason that the smoke in the superheating flues would have been hotter; while the vaporization would not have been proportionately increased. In evidence that strong firing, in some cases, makes less steam from the fire-box and contiguous flue surfaces than is made by moderate firing, the experiment of Mr. Johnson (lately shown before the club) is pertinent; a shallow copper cup was heated over a gas flame, and water then poured in, which did not touch the metal, and vaporized very slowly. Jacob Perkins heated a thick iron cup to a white heat, removed it from the fire, and poured a measure of water into it, which vaporized in 90 seconds; a second measure in less time; a third in less still; until the seventh measure, which vaporized in six seconds; the eighth measure did not boil—thus showing that the temperature of maximum effect was low. Mr. Perkins considered it 30° above the temperature of the water.

In practice, it has been found that fire-box plates blister, become thin, crack and leak. Bury's fire-boxes, at two points, were made with two-inch water spaces, and at these points they bulged half an inch. Some anthracite locomotives, with three-inch water spaces, burned out their fire-boxes in six months; but when four-inch spaces were given, they worked a year without perceptible deterioration. The four-inch water spaces in the Liverpool steamers contained only steam, and were rapidly burned out when the firing was free. The tubes of locomotives, when ⅜ apart, have shown evidence of overheating; and, in one instance, 30 tubes were left out, and the rest set ¾ apart, and more steam was made than before. The *Great Britain*, with ⅜ interval between the tubes and narrow down-flow spaces, and 1,769 feet of surface, evaporized 230 cubic feet per hour; while the *Sphynx*, with 11-16ths intervals and wide down-flow spaces, and 952 feet of surface, vaporized 233 feet per hour, with a blast pipe relatively larger; showing 7.7 and 4.1 feet of surface to vaporize a cubic foot per hour. Further; some early locomotives burned 167 lbs. of coke per hour per foot of grate, and worked at 50 lbs., maximum pressure, without expansion; their tubes were worn so thin as to collapse after 3,000 miles; but in recent practice tubes have lasted 75,000 miles with coke, and 130,000 to 140,000 with coal. The recent firing has been more gentle, but the main cause of the durability has been that the higher pressure keeps the foam denser, and therefore more in contact with the metal. Recent boilers, in which the water spaces are from 5-16ths to ⅜, have been disabled from heat, without having done two solid weeks' work.

Prosser's boiler, although it works well with a moderate fire and high pressure, and is saving of fuel, is liable to be burned out in a few days if driven by a strong blast, and the pressure be run down to 50 lbs. or less. In such a case, there would probably not be a drop of water in the crown sheet slab and annular spaces; but superheated steam alone would receive heat and carry it up to the water in the main chamber.

Mr. Dibben—Steam, in contact with water, may be superheated from above to any extent. It is a very poor conductor, and the hottest portion would remain at the top. Steam occupies less space than its elements would if only mechanically mixed; a cubic foot of steam, at atmospheric pressure, weighs about 250 grains; a cubic foot of corresponding mixture of hydrogen and oxygen, say 100 grains.

At the suggestion of the president, the meeting filed upon the sense in which the term *superheated steam* should be used, viz., steam at a temperature higher than that at which it is generated.

Professor Hendricks—Steam follows the law of expansion of permanent gases; after steam is generated, the power that would be realized by superheating would be calculated precisely as we calculate the effect of heat in the caloric engine.

Mr. Seely—Gases expand at the rate of 1-490th of their volume at 32° for each addition of one degree of heat; a gas at 32°, on being heated 490° higher—namely, at 522°—will be doubled in volume; if heated to 1,012°, trebled, &c. A cubic inch of water at 212°, converted to steam, occupies a cubic foot, nearly; this expansion is brought about by the addition of such an amount of heat as would raise the water 1,000°, provided it did not change to steam. But a cubic inch of steam, at 212°, raised 1,000°, would occupy only about three cubic inches. It has been settled by Joule, Thompson and others, that the mechanical effect of expansion is mathematically measured by the amount of heat which causes the expansion—a unit of heat generates a unit of mechanical power of expansion; therefore, *theoretically*, it matters not what substance is taken for the expanding body in an engine. But the expansion of solids and liquids is through such short extent that any contrivance we know of is altogether too clumsy to multiply the motion for practical use. The solids and liquids which expand to vapors at moderate temperatures are only useful. If water vaporized at the temperate of ether, we would find it better for steam engines.

Mr. Garvey—Not more than 1-10th of heat produced is utilized in practice. An engine will shortly be brought out which utilizes all the heat; I am not at liberty to enter into particulars.

Mr. Fisher—The highest standard of engine-working is one pound of coal per horse-power per hour. It is reported that the average duty of Cornish engines, 10 years ago, was 1⅓ lbs., of coal per horse-power per hour.

Mr. Dibben—I am not acquainted with any very reliable experiments as to superheating steam after it has left the boiler; statements made are conflicting and uncertain. In marine engines, the steam travels 25 or 30 feet from the boiler to the cylinder; thus requiring considerable superheating to prevent condensation. Pipes for superheating are soon burned out; the rapidity of burning is greatly increased on the stopping of the engine, as there is then no circulation in the pipes. I have seen a contrivance for letting water on the superheating surface whenever the engine is stopped.

The President—All our discussions of the arts are finally reduced to a question of *economy*. The benefactors of mankind are those who lessen the cost of production. In a mining operation with which I was once connected, it required two tuns of coal to one tun of ore; then it was cheaper to carry the ore to the coal. Now much less than one tun of coal will do the work for which two were used.

Mr. Seely—We now know how to calculate the exact value of coal or any other fuel; and we know precisely how much heat we waste.

Professor Reuben—Any heat going up the chimney is lost; also, it may be lost in an engine in the passage from the boiler to the cylinder. Cornish engines utilize only 14 per cent of the heat produced.

Mr. Dibben—Marine engines do not utilize so large a per cent. Caloric engines utilize a fair per centage; but the advantage is compensated by increased friction, rapid destruction of the heating surfaces, &c.

Mr. Larned—I consider it a duty to myself to state that I am the inventor and patentee of the essential feature of the boiler named here as Prosser's. For steam fire-engines (Lee & Larned's), we use the boilers in question. We use steam from 50 to 200 lbs. When all is in order, we get pretty dry steam, due, first, to the high pressure (keeps down the water); and second, to the large upper steam-heating surface. We observed water in a spheroidal condition in the boilers three years ago, but not lately. We get a great benefit from the superheating; we are positive on that point.

Mr. McCarty—If steam-heating pipes burst, little damage may be anticipated, compared with a boiler bursting.

Major Serrell then compared the working of the steamer *Bay State* with that of a locomotive, and said:—"The conclusions are based on accurate data, as follows:—

"The steamer:—Diameter of cylinder, 76 inches; stroke, 12 feet; steam, at 27 to 30 lbs.; revolution, 16 to 18 per minute; cut off, ½; trip, 170 to 180 miles; time, 10 to 11 hours; coal burned, 50 tuns; cargo, 170 tuns; passengers, 100.

"The locomotive:—20-inch cylinder; 24-inch stroke; effective pressure, 120 lbs; wheel, 4.8; 30 miles an hour.

"The result of the calculation from such data is the development for the power of the *Bay State* of 51,716,444 foot (pounds) per hour, and that of the locomotive of 64,204,800 foot (pounds). When the steamer reaches Fall River, one small locomotive runs away with her whole cargo and passengers!"

In a conversation which ensued, similar statistics and calculations were presented with reference to the steamers *Commonwealth*, *New World*, &c. The subject was then ordered to be resumed on the following week.

STATISTICS OF LITERATURE.—The tables of literary mortality show the following appalling facts in regard to the chances of an author to secure literary fame: Out of 1,000 published books, 600 never pay the cost of printing, &c.; 200 just pay expenses; 100 return a slight profit; and only 100 show a substantial gain. Of the 1,000 books, 650 are forgotten by the end of the year, and 150 more at the end of three years; only 50 survive seven years' publicity. Of the 50,000 publications put forth in the seventeenth century, hardly more than 50 have a great reputation, and are reprinted. Of the 50,000 works published in the eighteenth century, posterity has hardly preserved more than were rescued from oblivion in the seventeenth century. Men have been writing books these 3,000 years, and there are hardly now more than 500 writers throughout the world who have survived the outrages of time and the forgetfulness of man.

THE steamship *Adriatic* has made a trial trip to sea for a few days, and it is said that her new valves work well.

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MANUFACTURE AND USES OF STARCH.

[Continued from page 151.]

The fermenting process of wheat to obtain starch is objectionable from the length of time which it requires, the noxious products which arise from it, and the destruction of about 30 or 40 per cent of useful substance, which passes off as gas. A process to obviate this waste was invented, about twenty years ago, by M. Martin, of Paris. He first kneaded the flour into a dough, then introduced it into a wooden cylinder in which a series of cutters were revolving on an axis. In this cylinder there were openings covered with fine copper gauze, and while the starch was washed through these by a copious stream of water, the gluten was retained inside and saved. This, when dried and pulverized, is now sold in London under the fictitious name of *somolina*. By adding such gluten, obtained in the starch manufacture, to common flour, the latter is very easily made into macaroni and similar flour pastes.

Wheat starch is extensively used by calico printers for thickening those colors in which free acids form part of the composition. A similar class of starch is also obtained from Indian corn, rye, barley, oats and buckwheat. Good, dry wheat flour contains 73.2 per cent of starch, 13.4 of gluten, 5.6 of sugar, 0.2 of dextrine or gum, 11.1 of water, 2.2 of fatty matter. Gluten is composed of glutine, fibrine, and albumen. It is found that 100 parts of wheat give white flour, 58 per cent; brown flour, 14; bran, 26; loss, 2.

Potato starch, sometimes called farina, is extensively manufactured on the continent of Europe. The best potatoes contain, by analysis, 74 per cent of water; 20 of starch; pectates of lime, soda, and potash, in skin, 1.65; salts, albumen, and sugar, 4.35. The potatoes are first washed, then grated to a pulp in a machine; the pulp is then washed through sieves, by which means the starch is separated by passing off with the water, and is afterwards secured in shallow wooden boxes lined with felt. It is subsequently dried on floors of plaster-of-Paris, which absorb the moisture; and, finally, it is dried in a warm room. Potato starch, thus prepared, is suitable for linen, but not for food, as it has a rank taste and an unpleasant smell. These, however, are removed by washing it with a weak solution of carbonate of soda, and, thus treated, it is manufactured into artificial arrow-root and tapioca. Many persons who pay for the latter substances only get potato starch. Deceptions of this character on the public are quite common. The famous "Glenfield starch" is made from potatoes, by mixing with the potato starch a very minute quantity of sulphuric acid, which converts all the insoluble starch into soluble dextrine, so that when this is boiled in water it forms a clear fluid, which gives to fine muslins and cambrics a transparent appearance. A process has lately been patented in England to effect the same change with oxalic instead of sulphuric acid.

An interesting application of starch has lately been made by M. Sorel, by which an artificial substance is produced, capable of being a partial substitute for horn, ivory, and gutta-percha. This new plastic material is made by mixing potato starch with chloride of zinc, in a solution of such a strength as will swell it out without dissolving it. The mass afterwards becomes hard and tenacious. To this some sulphate of baryta, in powder, is added, which renders it tough. An oxyd of zinc will effect the same object, but the latter renders the composition opaque, while the former does not affect its translucent appearance.

About 30 years ago gum arabic was almost exclusively employed for thickening the colors of calico-printers, but the great extension which took place in the production of such goods, in England, by a removal of the excise tax on the home produce, led to the demand for a cheaper substitute. It was discovered that by exposing moist starch in an oven heated to 250° and 300° Fah., it was converted into a soluble substance, which was at first called "British gum." This was the very thing wanted, and it at once took the place of gum arabic for mixing with the more common colors. This change in the condition of starch is entirely a molecular one, as both the raw and the roasted starch have the same composition, but the latter is soluble, the former is not. Another remarkable difference between them is that the raw starch gives a blue color with iodine, while the roasted starch gives a purple color. If to 400 parts of dry potato starch one part of nitric acid, mixed with a sufficient quantity of water, is added, so as to form a hard paste, and dried slowly, then exposed for 20 hours in an oven to a heat of 200° Fah., a white starch gum is obtained, which is preferable, for some purposes, as the common kind is of an amber color. A most minute quantity of acid produces the molecular change in starch. Soluble farina (dextrine) can also be made from starch, without changing its color, by subjecting the moist starch in a cylinder (kept warm on the outside with steam) to the action of muriatic acid gas, conveyed by a pipe into the starch. White soluble farina may be employed as a substitute for gum arabic for almost every purpose. The dextrine called British gum is made from wheat flour, and it differs from that made from potatoes inasmuch as it is only soluble in water at a boiling temperature.

[To be continued.]

THE CURCULIO.

MESSRS. EDITORS:—There seems to be considerable talk about coal tar for fruit trees. One of your correspondents (C. F. R.) says that a ring around a plum tree will protect the fruit from the curculio. Now I would as soon believe that a ring of coal tar around a cherry tree, would preserve the ripe cherries from the robins as that a ring around a plum tree would protect the plums from the curculio. The curculio flies from one tree to another, and from the ground up into the tree, and I cannot conceive how a ring around the trunk could keep it from the plum tree. It looks about as reasonable as a powder that a certain man from your city circulated through the country, last spring, to protect plums from the curculio and other insects. It was to be put in a little incision made in the bark of the tree. This looks to me just like a man taking a dose of fly poison to keep the flies from alighting on his face while asleep.

G. W. C.

Morenci, Mich., Feb. 22, 1860.

SALT, SNOW AND DIRT.

An ordinance passed by the Common Council of this city, prohibiting the use of salt to melt the snow, received the signature of the mayor a few days ago. After the snow season is over and the warm weather begins to set in, *then* our enterprising authorities bestir themselves with their accustomed vigor to protect the citizens from injuries arising from the abominable practice of salting our streets, whereby they are converted into a sea of cold, briny slush! Many of the side streets leading to the rivers are almost impassible from the piles of filth which have been suffered to accumulate in them during the winter, and every considerable rain washes a vast portion of it into our docks, and thus our harbor is gradually being allowed to fill up through the imbecility and corruption of the city government. Verily, no other city in the world is so wretchedly governed as this.

AN ENEMY TO THE BRITISH OAK.—For some years past, a silent, unsuspected enemy has been invading the oak forests of England. In all the south-western counties *galls* (like those which we get from the Levant for dyeing black) have been making their appearance, and annually increasing in quite a geometrical ratio. On several occasions the subject has been adverted to in our columns, especially in the year 1855, when Mr. Westwood published a figure of the gall, and a few months later by a correspondent at Worcester. Since that time the mischief thus caused has increased so alarmingly that, unless some effectual stop can be put to the evil, the landowners of Devon, Cornwall, Dorset, Somerset, and even Gloucestershire, will have to abandon all hope of raising oak timber. The trees have ceased to grow, acorns no longer appear, but in their stead the branches are loaded with hard, dry balls.—*Gardeners' Chronicle.*

USES OF PHOTOGRAPHY TO INVENTORS.—It is proposed to photograph copies of drawings sent from the Patent Office, instead of tracing them, thus very much reducing the expense of supplying them to inventors and others who need them. Why not photograph the copies of *specifications* also? This is certainly cheaper than copying them with pen and ink. A good draftsman can, on the average, trace a patent drawing while a good copyist can reproduce a page of the accompanying manuscript. And by this process all mistakes would be avoided. It is likely that, by making the original specification on one large page, in a clear handwriting, a photograph considerably reduced would still be very legible; by a proper arrangement, the drawing, specification and all, could be copied at one operation.—*Railway Review.*

A COLUMN OF VARIETIES.

Rain purifies the air by absorbing, as it falls, the carbonic acid and ammonia which is always floating in the air. Snow absorbs a still larger quantity of these impurities, hence the peculiar purity of the air after a snow-storm. When cakes are mixed with snow and baked, these gases are expanded by heat and form the little cells in the dough which make the cakes light. They are wholesome in the stomach though injurious in the lungs. .....Ammonia consists of nitrogen and hydrogen in the proportion of 14 lbs. of nitrogen to 3 lbs. of hydrogen ($N H_3$). There is no mode known of producing this combination by artificial means. Only one force in nature can effect it—that of life, either animal or vegetable.....Water absorbs 670 times its own volume of ammonia, which is condensed so much in assuming the liquid form that it constitutes only 32½ per cent of the water of ammonia.....The amount of gold thus far received from Pike's Peak is, as nearly as can be ascertained, $460,000. Of this $250,000 is at the Philadelphia mint, and the director of the mint says it will average .825 in fineness, and is worth $17.50 per ounce..... The swiftest horse ever known was "Flying Childers;" he performed 4 miles, 380 yards, in seven minutes and a half, which is at the rate of over 33 miles per hour..... Vertigo or giddiness in sheep is occasioned by the presence in the brain of a parasite, known as a *hydatid*—the *cœnaris cerebralis*. It is most observable among lambs, whose ages vary from two to twelve months. The adult animal usually enjoys immunity from the encroachments of this peculiar parasite.....At the commencement of the Crimean war, the French goverment had 80,000 horses; at its termination they could only muster 10,000.....The large planet now seen in the evening in the western horizon is Venus, making three planets now visible in the evening—Venus, Jupiter and Saturn. Mars rises about midnight.....Some years ago Professor Mapes laid a trap for the merchants and lawyers who monopolized the talking at the meetings of the farmer's club in this city, and succeeded in getting them to expend a whole evening in discussing the mode of telling the ages of cows by their upper teeth.....By *blood* in horses is meant the blood of the English race horse, and it is said that every animal of this stock has more or less of the blood of the Godolphin Arabian in his veins. This famous sire was imported into England about 110 years ago.....In trotting, the American horses have been for many years superior to those of all other nations..... Denmark has 45 horses to every hundred inhabitants, which is more than any other European country. Great Britain and Ireland have 2,500,000 horses; France, 3,000,000; Austrian empire, exclusive of Italy, 2,600,000; Russia, 3,500,000. The United States have 5,000,000 horses, which is more than any European country. The horses of the whole world are estimated at 57,420,000.....There are two things which the Americans, with all their ingenuity, have never been able to make equal to a Frenchman; one is a boot, and the other a loaf of bread....Lines have been made on a metal plate with a diamond point so fine that over 49,000 were contained in an inch; that is over 6,000 in the eighth of an inch! Of course they could only be distinguished by microscopes of high power.....Eli Whitney, the inventor of the cotton gin, was born at Westborough, Mass., Dec. 8, 1765. He worked his way through college and graduated at Yale in 1792.....Mr. Fothergill has mentioned a case where, in consequence of too highly superheating the steam employed to work a large factory engine, the condensed water from the engine became charged with rust to such an extent as to spoil a large quantity of goods, for washing which the water was saved. .....It is well known that steam may be highly superheated whilst in contact with water. In the lofty steam domes of some varieties of marine boilers, the steam, heated by the heat passing through the uptake, is often at a temperature of from 340° to 400°, when that of the water is only 260°.....The resistance to motion in a fluid of a cylinder with hemispherical ends is but about three-fourths that of a sphere of a diameter equal to that of the cylinder. In some experiments the resistance to such a cylinder at a given speed was 46·29 lbs., whilst that of the globe was 64·87 lbs.....In working superheated steam in condensing engines, it is found that but about two-thirds as much injection water is required as when ordinary saturated steam is worked.

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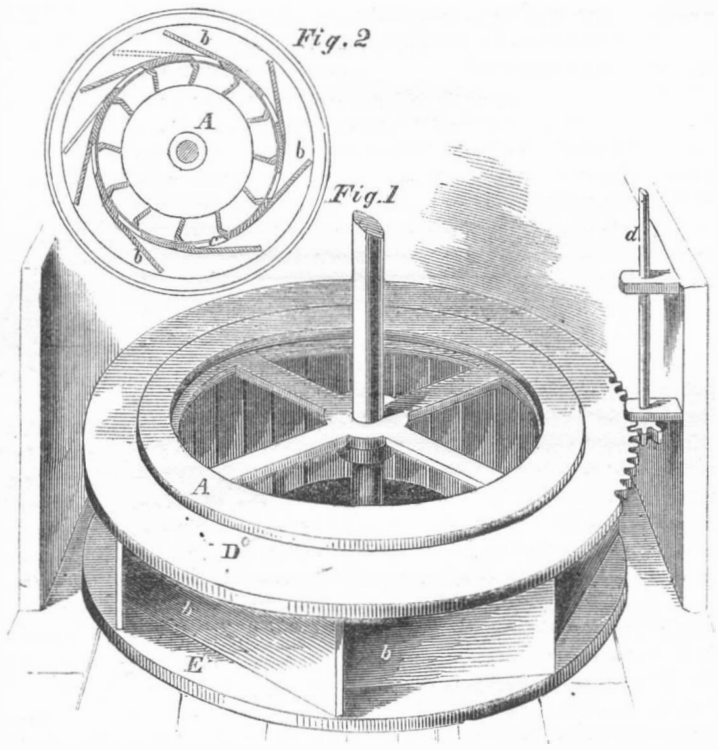
SMITH'S IMPROVED WATER WHEEL.

There is no more attractive field for the study of philosophical mechanicians than improvements in the horizontal water wheel. And if we are correctly informed in regard to the results of experiments at the Philadelphia Water-works, there would seem to be yet wide room for improvement in this department; the best turbines yielding only some 60 per cent of the power expended, instead of 80 or 90, as has been heretofore claimed. The annexed engravings illustrate a wheel embracing some novel features.



SMITH'S IMPROVED WATER WHEEL.

The wheel, A, revolves within the stationary cylinder, *c*; the buckets being bent at an obtuse angle, as shown. The water passes into the wheel through vertical slits in the cylinder, *c*, which slits are opened and closed by a very peculiar gate. This gate consists of the two rings, D and E, connected by the vertical plates, *b b*, which plates are slightly curved at their inner ends to fit the cylinder, *c*, from which arrangement it will be seen that by turning the rings, D and E, about their axes, the openings in the cylinder, *c*, may be either closed or opened to any desired width. Upon a portion of the periphery of the ring, D, a gear is cut which meshes into a pinion upon the shaft, *d*, so that by turning this shaft, by means of a hand-wheel or lever at its upper end, the gate is either opened or closed. This plan of gate causes the water to enter the wheel (whether the gate is wholly or partially opened), always in a vertical sheet of the full depth of the wheel, and consequently to act upon the whole surface of the bucket.

The patent for this invention was issued (through the Scientific Patent Agency) on June 21, 1859; and persons desiring further information in relation to it will please address the inventor, James Smith, at Westport, Conn.

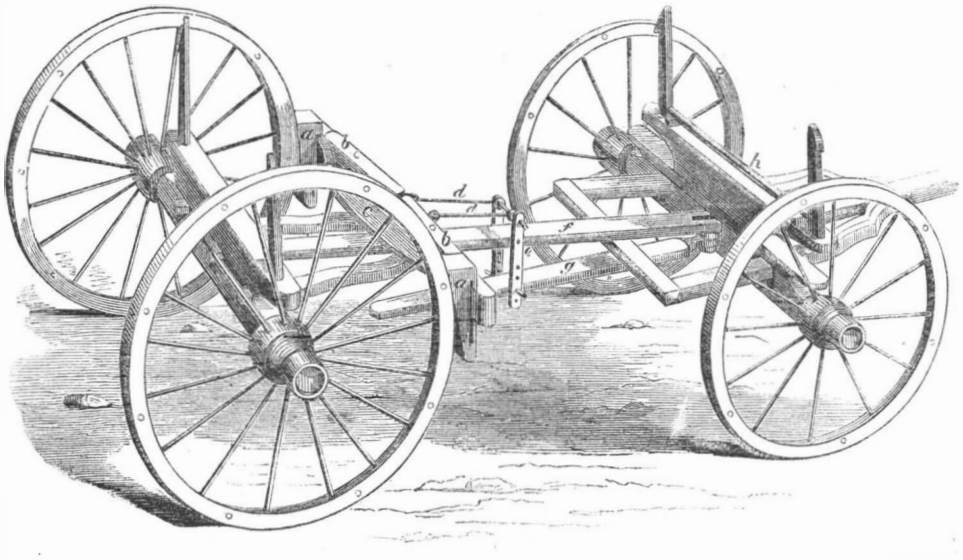
FIRE-ESCAPE—SLIDING FROM THE TOP OF THE CITY HALL.

Much amusement was furnished the multitude, gratis, this forenoon, by a fire-escape, of English invention, on the Park. The apparatus consists of a long cloth tube, supported by ropes at the sides, one end of which is fastened to the top of the building, while the other end is held by the spectators on the ground. Through this bottomless bag the persons in danger are expected to slide. A number of boys and men volunteered to slide from the top of the City Hall in this manner, and several hundred people looked on, greatly enjoying the sport. The slide was apparently pleasant and safe. At one time three boys went down in a heap at once. The bundle of juvenility was a little too large for the tubs, and the trio two or three times stuck fast, to the great merriment of the spectators. They struggled through it, however, and were taken out evidently as well pleased with the adventure as the spectators.—*Evening Post, Feb. 29th.*

[Since the burning of a tenement house in Elm-street, in which so many lives were lost (as detailed in a former number of this paper), the inventors of this city have manifested a commendable degree of enterprise in getting up devices for obviating a like calamity in future. It is marvelous to see how quickly a public want is filled by our inventors. Many of the plans devised seem to be practical; and after the patents are issued we shall describe the novelty and merits of some of them. The fire-escape exhibited at the City Hall (and termed by our cotemporary an "English invention") was illustrated and described on page 324, Vol. II. (old series), of the Scientific American. At that time (1847) the practical utility of the device was proved by the inventor, W. W. Van Loan, the veteran postmaster at Catskill, N. Y., who exhibited his plan upon a building in front of our office, which was then located at No. 128 Fulton-street.

IMPROVED WAGON BRAKE.

It is remarkable that, notwithstanding all the study which has been expended on wagon brakes, no one has before thought of the contrivance which we here illustrate. While it is apparently as simple as any brake can be, it is perfectly self-acting, coming into operation whenever the descent is sufficient to cause the wagon to run forward of its own accord, and requiring no attention whatever from the driver.



BROWN'S IMPROVED WAGON BRAKE.

The rubbers, *a a*, are attached to the levers, *b b*, which are pivoted to the crossbar, *c*. The inner ends of the levers, *b b*, are connected with the levers, *e e*, by means of the rods, *d d*. The levers, *e e*, are pivoted to the coupling rod, F, of the wagon, and have their lower ends secured by a bolt to the rod, G. The king-bolt secures the rod, F, to the forward axle by passing through an elongated hole or slot, which permits a motion backward and forward of the forward axle, carrying with it the rod, G, which, it will be seen, presses the brakes against the wheels whenever the wagon runs forward by its own gravity. A roller, *h*, supports the end of the bed over the forward bolster, to diminish the friction as the axle works back and forth under the bed. The rubbers, *a a*, are attached to the levers, *b b*, by means of long slots which allow the rubbers to slide upward when the wagon is pushed backward, reversing the direction in the motion of the wheels, thus relieving the wheels from the friction of the brakes.

The patent for this neat and valuable invention was issued Dec. 20, 1859, and persons desiring further information in relation to it will please address the inventor, Robert D. Brown, at Prattsburgh, N. Y.

THE AMERICAN INSTITUTE.

A meeting of the American Institute was recently held at the Cooper Institute, when the newly-elected president, General Hall, delivered his inaugural address, in which he spoke of the necessity of rendering the institute much more influential throughout the country at large. He thought that it should be a benefit to the nation in a scientific and mechanical point of view. The trustees made their report, in which they recommended the name of John W. Chambers for clerk, and to perform the duties of librarian without extra compensation, his regular salary being $1,500 a year. This caused a disorderly discussion, after which Mr. Chambers was elected clerk, and a motion to re-consider was voted down. A warm discussion then ensued, in which much acrimony was shown by the friends of the late librarian, whose services, at $800 a year, the Finance and Library Committees regarded as unnecessary. It was urged, by those in favor of economizing, that the agent, the recording secretary and the clerk were usually in the rooms, and that the clerk, with the assistance of a messenger at $5 per week, would be able to give all necessary attendance to the library. Mr. Chambers has long been connected with the institute, and has rendered it valuable service; but the *prestige* of the institute is gone, and it will need a vast deal of good conduct on the part of the managers to render it influential throughout the country, as is suggested in the president's address.

Patent Office Reports for 1858.—In answer to numerous inquiries respecting these reports, we would state that we cannot furnish them. It was with some difficulty that we could procure a supply sufficient for the purposes of our own office, which has become the rendezvous for inventors and patentees who wish to find out anything relating to patents. The Commissioner of Patents is, or ought to be, furnished with enough to supply a set to every patentee for the year. If he is able to do this, nothing more can be expected of him; since Congress, in its wisdom, has seen fit to furnish the Patent Office with, comparatively, but few copies. The bulk of the reports are given over to members of Congress; and to these functionaries we refer those of our readers who may desire to procure them. There are three volumes containing illustrations and claims of all the patents granted during the year 1858; and one volume devoted to agriculture and meteorology, with an illustration of the *Boss Grunniens* or Thibet bull—a ruminant mammal, with cylindrical horns, pendant hair and horse-like tail—one of the ugliest looking beasts we ever beheld. These reports are very useful, and are becoming more valuable each year.

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NEW YORK, SATURDAY, MARCH 10, 1860.

THE POWER OF COAL.

T the present moment the island of Great Br tain is the richest in the world. People from almost every quarter of the habitable globe resort to London to raise the means necessary to build railroads, construct ships, sink mines, and to carry out other engineering projects where vast outlays of money are required. This is a strange spectacle, truly, and how can we account for it? The island is insignificant in extent; the population small, in comparison with many other countries, and the climate is well known to be capricious. Its increased riches are not owing to the number of its inhabitants, its extent of territory, the richness of its soil, or the serenity of its climate; the source of its great wealth lies beneath its surface, in the deep and dark coal mine, where the Author of Creation has stored up the accumulated vegetation of byegone ages for the development and use of this age of steam, iron and manufactures. The skies of Italy and France are sunny and bright, and the purple vine covers the slopes of Burgundy and Piedmont; while the skies of England are murky, and the sunlight, even in flowery Devonshire, is too cold for the grape to yield its fruitage. Yet, with all these disadvantages on the part of England, Italy is poorer and France less wealthy; for with the products of her mines and minerals other countries have become her tributaries.

From an article in the last number of the *Edinburgh Review*, on Professor Rogers' essays on the coal formations of North America and Great Britain, we obtain a more exalted view of the power of coal than we ever entertained before. We derive from coal our artificial light and heat; it is the latent force which gives life to the steam engine; and it is the concentrated energy which propels our countless forms of mechanism. It is a subject of intense wonder that perishable vegetable formations which flourished long before man appeared on the globe, should have been covered up for centuries beneath the rocks and now rendered subservient to the latest applications of human skill, for increasing the productive powers of man to an extent which almost baffles the mind to calculate. The mechanical power of England represented by 10,000,000 tuns of coal devoted to steam engines is equal to the labor of 66,000,000 of strong men per annum. Is it any wonder that such a stupendous power should have given England the mastery in commerce and manufactures? The possession of coal mines are momentous in their consequences; and the annual product of England for all purposes is no less than 68,000,000 tuns. In the Middle Ages, France and Germany supplied England with all kinds of manufactures; but the tide of commerce is changed, and all owing to the natural possession of great coal mines, of which there are no less than 3,000 in the island. A commission of French cotton manufacturers who visited Manchester, three years ago, made a report on their return, and declared that although English operatives were paid higher wages, yet, owing to cheap fuel and machinery, they could produce cotton goods at about one-half the price of the French. Such is the power of coal!

We may take it for a settled fact that the country which possesses the greatest deposits of coal contains the greatest resources of mechanical and industrial power. Were the coal fields of England to cease being productive in 1860, the wealth and power of Great Britain, which are developed in her steamships and countless manufactures, would be annihilated, and the kingdom would sink to a diminutive power in a few years. The coal fields of the world are distributed as follows:—United States, 196,000 square miles area; British North American provinces, 7,530; Great Britain, 5,400; France, 984; Prussia, 960; Belgium, 510; Bohemia, 400; Spain, 200; Russia, 100. The extent of the Pacific and Asiatic coal fields is unknown. From these geological coal statistics it is not difficult to predict what country is destined to be the future mistress of the world in wealth and power. Owing to the vast amount of coal raised in England annually, many of the mines will be worked out in 300 years; and at the present rate they will *all* be exhausted in about 1,000 years. Long before that date, the "Court of St. James" may be transferred to Nova Scotia or New Brunswick, where the coal fields are rich and extensive; but whether such a a result ever takes place or not, the future superlative greatness of the United States is just as certain as that the sun shines. On the other hand, it is equally evident that Russia never can become a great power; she may have the muscle, but she never can have the *steam* to become an industrial giant. According to the operations of natural laws our wealth must increase with the development of our coal power, of which we have a natural treasury thirty-four times more extensive than that of England. It is only a question of time, for the United States to become the great mistress of the world, and her coronal will be a wreath of *black diamonds!*

QUARTZ-CRUSHING MACHINERY.

This is a most interesting subject to our miners, who are now neither few nor far between in wealth and numbers. In Virginia, North Carolina, Georgia, Tennessee, California and Arizona, many companies are now engaged in this kind of mining for obtaining gold, silver and copper; and the best mill for crushing the quartz is an object of the very first consideration. Many miners consider the old stampers, combined with the Chilian mill (large rollers), the best quartz machinery that has ever been tried. Still there are opposite opinions to this; and it is well known that quartz mills have called forth an immense amount of novel invention, and yet dissatisfaction prevails in the minds of many miners in regard to all the machines yet tried. In this state of the matter, we find some information on the subject published in the London *Engineer*, it being the substance of a paper read before the Society of Engineers by P. F. Nursey. He mentions Cochrane's, Berdan's and Dr. Collyer's American crushers, but he gives the credit of the best machinery known in England at present to Mr. J. Mitchell, a chemist. He employs conical friction rollers between iron balls, rotating in an annular trough. The conical rollers are in contact with the balls, and communicate to the latter a rotary motion on a vertical axis, in addition to that around a horizontal. The quartz ore is reduced to an impalpable state in this mill, then it is carried through twelve amalgamators, each of which is furnished with two revolving screws. The ore, in its passage from the quartz-crusher to its exit at the last amalgamator, traverses in an hour a distance of 11 miles, within the compass of an amalgamating house only 30 feet in length. It is stated that this apparatus is coming into extensive use in the South American gold and silver mines, with an increase of precious metal in its working amounting to 250 per cent—a prodigious increase, if true.

Gold exists in almost every part of the world in some form or combination, but it is found in few places in sufficient abundance to pay for the expense of working, either by washing the sands or extracting it from the rocks by crushing and amalgamation. No country in the world possesses an equal amount, with ours, of natural gold resources; therefore every improvement, however small, is of much consequence, because we expect that our gold mines will employ large numbers of miners for centuries to come. In England gold exists in what is called *gossan*, which is a red oxyd of iron; also in the outcrop of copper and other metal lodes; but the quantity is so small to the tun that it does not pay for the working. It is only in the quartz rocks, as a matrix, that it has as yet been found in sufficient quantities to pay for the labor of extraction. Where fuel is abundant we counsel our gold-miners to roast their quartz before submitting it to the crushing mill, as it becomes much more brittle and easily crushed by the machines afterwards. We know that in several places fuel is too expensive at present to employ it for roasting the quartz; but for all such situations, efforts should be made to obtain cheap fuel by railroad or steamboat, as the roasting of the quartz saves an immense amount of mechanical labor.

THE WAY TO TELL THE TIME OF NIGHT BY THE STARS.

With suitable instruments, the time can be ascertained by the stars *more* accurately than it can in any other way; and it is easy to tell it approximately, say within half an hour, without any instruments whatever. Let us describe a simple, rough device for this purpose, as the easiest mode of explaining how it may be done by the unaided action of the eye and judgment.

Take a keg or barrel hoop, or a hoop of wire, and divide it into 24 equal spaces, marking the dividing points for hour points. Connect the opposite hour points by lines of fine twine drawn across the diameter of the hoop. Hang the apparatus against a north window, and place the eye in a line with the middle of the hoop (where the wires cross each other), and the north star. Now any of the fixed stars, in its daily revolutions about the pole, will pass from one wire to the next in an hour. Let us select the nearest pointer in the "dipper" (Alpha, Ursa Major) for the hour hand on our great clock of the heavens. Place the eye at such distance from the apparatus as to bring this star just within the hoop, keeping the center of the hoop in line with the North Pole. On the 5th of March, the star Alpha, Ursa Major, will be on the meridian, directly over the north star, and consequently in line with the upper vertical wire of our apparatus at 12 o'clock, midnight; and as it passes from one wire to the next in an hour, if it is seen in line with the first wire at the right of the vertical one, the time will be 11 o'clock; if in line with the second wire at the right, 10 o'clock; and so on. While if it has passed the middle, and reached the first wire at the left, the time indicated is 1 o'clock; the second wire 2 o'clock; and so on.

This star, in common with all the other fixed stars, comes to the meridian about four minutes earlier each night or day than it did on the preceding night or day. Consequently on the 5th of April it will reach the vertical wire at 10 o'clock at night, and the other wires at corresponding times; and this variation continues at the rate of two hours in each month throughout the year.

From this description, the mode will be readily understood of telling the time of night by the stars without the aid of instruments. We require to learn two stars—the pole star and that one of the pointers which is the nearer one to it—to remember that this latter star is directly over the north star at midnight on the 5th of March, and comes to the meridian two hours earlier on the 5th of each month than it did on the 5th of the preceding month. As the star revolves around the circle in 24 hours, it will, of course, revolve one-fourth the distance in 6 hours, being at right angles to the meridian 6 hours from the time it is on the meridian, and at an angle of 45° 3 hours from that time.

The apparatus which we have described will be more accurate if the top is inclined forward from the perpendicular at an angle corresponding with the latitude of the place in which the observer is located, bringing it perpendicular to the axis of the earth, and in a plane parallel with the plane of the equator.

APPLICATIONS FOR THE EXTENSION OF PATENTS.

Cooking Stove.—R. D. Granger, of Albany, N. Y., has applied for the extension of a patent granted to him on the 13th of June, 1846, for an improvement in cooking stoves. The petition is to be heard at the Patent Office on the 28th of May next; and the testimony closes on the 14th of that month.

Sugar Pan.—Elizabeth A. Harris, administratrix of Alfred Stettman, late of New York, deceased, has applied for the extension of a patent granted to said Stettman on the 16th of May, 1846, for an improvement in sugar pans. The petition is to be heard at the Patent Office on the 30th of April next; and the testimony closes on the 16th of that month.

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IMPORTANT TRIAL OF A PATENT SUIT AT BALTIMORE.

I. M. Singer & Co., *vs* William Walmsley, agent for Ladd, Webster & Co. The plaintiffs in this action are the well-known manufacturers of sewing machines in this city, and the real defendants, Messrs. Ladd, Webster & Co., of Boston, who are also manufacturers of sewing machines. The plaintiffs alleged that the defendants, in the sewing machines made by them, infringed five separate patents granted to I. M. Singer, comprising eight distinct claims. Several different defenses were set up by the defendants to these claims. 1st, That the devices employed by the defendants were not like the improvements described and claimed in the plaintiffs' patents, and therefore could be no infringement. 2d, That the improvements claimed by the plaintiffs were not new, and the patents void for want of novelty. 3d, That one of the plaintiffs' patents was invalid because of an error in the description of the machine, or its mode of operation. 4th, That some of the inventions claimed did not belong to the patentee, but were really invented by another person. 5th, That one of the patents was invalid because the patentee had not disclaimed certain devices which he had become informed were invented by another person before he invented them. The main force of the attack and defense was directed to the above-mentioned first and second points raised by the defendants.

The trial was commenced about the middle of November last, when three days were occupied by the plaintiffs' counsel in opening the case and putting in the formal proof of infringement. The court then adjourned over till the 2d of January, 1860, on account of the illness of a near relative of the leading counsel of the defendants. On the 3d of January the trial was resumed and continued from day to day, consecutively, until the 25th of February, when it terminated in a general verdict for the defendants.

This verdict, if sustained by the decision of the Supreme Court of the United States (to which we are informed, it is to be carried for review) is one of considerable importance to those who manufacture and use sewing machines, as it tends to give to the public the use of certain improvements which have hitherto been generally supposed to be covered by some of the numerous patents owned by I. M. Singer & Co. As the interests at stake are so valuable, it is not likely that either party will relinquish the contest, so long as any means remain for prolonging it.

The plaintiffs, we are informed, directly this trial was terminated, announced their intention of trying other suits in Baltimore, Philadephia, and New York, involving the same machines of the defendants, with the least possible delay. The present verdict the defendants regard, and justly, as a great triumph.

The plaintiffs claim that the instructions of the court to the jury, in regard to the doctrine of mechanical equivalents, was erroneous, and fatal to their success on this trial. The ruling of the court on this point, we are informed, was, that a patentee can only invoke the aid of mechanical equivalents to sustain his patent, when he has invented an entirely new art or process, and a mechanical device or devices for making such art or process available; but that in all cases where a patent is for an improvement in some known art or process, the doctrine of mechanical equivalents does not apply, and cannot be called in to aid in sustaining the patent. The plaintiffs complain that the rule of construction applied to their patents by the court, in regard to the use of mechanical equivalents, would be utterly destructive to nineteen-twentieths of all patents for improvements of acknowledged utility. If the court did intend to decide that the substitution of one well-known mechanical equivalent for another would, in ordinary cases, be sufficient to escape the force of a patent, it is evident that but few patents could be upheld in that tribunal.

We shall watch and duly report the further progress of the great controversy respecting sewing machine improvements, which promises to be as prolific in protracted and expensive litigation as telegraphing machines or india-rubber.

COST AND PERFORMANCES OF LOCOMOTIVES.

The master of machinery—T. Perkins—of the Baltimore and Ohio Railroad, gets up very neat monthly reports of the performance and cost of the locomotives on that road. His report for the month of January—just received—contains some very interesting items. There are 29 passenger and 170 tunnage engines (including switch engines) on this railroad. With but one exception, they are all coal-burners. The total cost for each mile run by the passenger engines was 9 cents; the cost for running tunnage engines, 18.8 cents. The number of pounds of coal per mile consumed by a passenger engine was 31.3; cost for repairs per mile, 4.9 cents; for coal, 3.4, or 1.5 less than for repairs. The cost for repairs per mile to the freight engines was 12.7 cents; for fuel, 5.3—not the half of the expense incurred for repairs.

This report enables us to compare the difference in expenditure in operating a coal-burning and a wood-burning locomotive. We find that the total cost for operating the coal-burners is 9 cents per mile, that for operating the solitary wood-burner is 10.1—not such a great difference as we would expect to find. The cost for coal is but 3.4 cents per mile, that for wood 7.0 (about double), so that the cost of fuel is in favor of the coal-burners. Why, then, is the total difference of expense in working so small between them? We find that the cost for repairs per mile to the wood-burner is but 2.2, while that for the coal-burners is 4.9. The extra cost for repairs in using coal, we suppose, is owing to the more rapid burning out of the fire-boxes of the boilers.

WEEKLY SUMMARY OF INVENTIONS.

The following inventions are among the most useful improvements patented this week. For the claims to these inventions the reader is referred to the official list on another page:—

FIRE DETECTOR.

This instrument supplies a want that has long been badly felt, especially on board of vessels, where, with the present arrangement, it is impossible to determine the temperature of the cargo in the hold. Many vessels have been destroyed by spontaneous combustion of the cargo, which might have been saved by this instrument, which indicates the temperature of the cargo in any part of the vessel by means of a scale and pointer on the deck or in any convenient part of the vessel. If the cargo begins to heat, it is ascertained at once, and measures can be taken to prevent danger before it is too late. The inventor of this truly valuable instrument is W. D. Grimshaw, of Newark, N. J., who has secured a patent for the same both in the United States and in England.

AIR TRAP.

Thomas Sault, of Seymour, Conn., has invented a new air trap for steam apparatus, which consists in a valve of hard vulcanized india-rubber, so applied within a box of metal or other material attached to a radiator for heating a building or apartment, or to any apparatus heated by steam, as to provide by the agency of its vastly greater capability of contraction and expansion with changes of temperature as compared with the metal or material of which the box is made, for the escape of any air that may have collected within the steam space before it has been filled with steam, or when the steam has condensed therein, but to prevent the escape of steam therefrom.

POLICEMAN'S CLUB.

The object of this invention is to prevent the club being wrenched from the hand of the policeman while in the discharge of his duty, a contingency which frequently occurs, and subjects the officer to punishment from his own weapon. The invention consists in providing the club (which is constructed similar to those ordinarily used) with a sheath or cover secured by a spring catch in proper position on the club, and so arranged that when the club is grasped by an opponent, the officer, by actuating the spring catch, releases the sheath, which is the only part that can be seized or grasped by the opponent, and consequently liberates the club; the sheath being left in the hands of the opponent, and the naked club in the hands of the policeman or officer. John L. Rowe, of this city, is the inventor.

PEN AND PENCIL CASE.

This invention relates to an improvement on a pen and pencil case, for which Letters Patent (bearing date July 12, 1859), were granted to the inventor, John Richardson, of this city. This patented case has two spirally slotted sleeves fitted on a common tube which contains the pencil tube, the sleeves abutting at their inner ends against a collar on the tube which encompasses the sleeves, and all arranged in such a manner, in connection with an outer shell, and in such a relation with the pen and pencil slides, that either of the latter named parts may be moved independently of the other, so that on withdrawing one within the case, by continuing the same movement of the outer shell, the other will be thrown out. This arrangement of parts operated well, and answered an excellent purpose; but, in common with other inventions of the same kind, a long case was formed, even when contracted to its smallest dimensions. The object of this invention is to overcome this difficulty and obtain an extremely portable pen and pencil case, and, at the same time, retain all the advantages possessed by the patented case above alluded to.

FOREIGN NEWS AND MARKETS.

They do things up in grand style in London. The tunnel under the river Thames, and the *Great Eastern*, are world's wonders, and no where out of London could such projects be carried out at the present day. But something more magnificent still than the Thames tunnel is about to be achieved in London, and the work has already commenced; this is the tunneling of the city itself for a grand "trunk" underground railway, intersected by several lines, to get rid of the crowded thoroughfares. The expense will be enormous, but there is plenty of money in the British metropolis to do the work and to do it well.

At a late meeting of the English Geographical Society, a number of distinguished literary and scientific men being in attendance, a paper was read from Mr. William Wheelwright, an American (who has been for a long time engaged in building railroads in South America), in which he expresses the opinion that the Andes might be crossed by a railroad, thus making a line from the Pacific to Rosario, *via* Cordova, a distance of 1,100 miles. The route has been carefully explored, the elevations fixed by barometrical measurement, and the Pass of San Francisco ascertained never to be blocked by snow, travelers crossing it at all seasons. The author is of opinion that the construction of such a railroad, though difficult; is practicable, and the advantages that would accrue by opening up the South American States to commerce would be large; the Rio de la Plata being navigable at the foot of Rosario for vessels drawing twelve feet of water. It appears that the South American States are so fully alive to the advantages they will derive from the execution of this project that the Argentine republic has offered a free grant of land, five miles in breadth, on either (each?) side of the railroad.

In Scotland a great strike has just taken place among the iron-smelting operatives in the vicinity of Glasgow. No less than 100 blast furnaces have been put out in consequence, and the result is, that the iron-masters in Staffordshire (England) are enjoying the benefits of increased orders. In all likelihood, however, the strike will result in a rise of Scotch pig iron, which is of such a peculiar character that a rival to it has not yet been found anywhere for certain kinds of castings requiring a very smooth surface.

In Sheffield, England, solid cast steel spades and shovels are now manufactured. They take a bar of solid cast steel, into which, by powerful machinery specially erected for the purpose, they punch a hole just large enough for the foot of the handle to enter: afterwards they forge and hammer it down to the required thickness and finish. Thus the tool, being of cast steel, is uniformly strong throughout.

A mechanic of Paris has introduced a neat pocket machine for the manufacture of paper cigarettes, by means of which a smoker may make his own segars of such tobacco as he chooses. It consists of a small wooden mold, within which is placed a thin paper tube, which is quickly rammed full of tobacco by means of a little funnel and rammer inserted at the large end. The cigar is then pushed out complete, and is ready for smoking. The papers, which are very thin and light, and are colored to resemble common cigars, accompany the apparatus.

A correspondent of an English paper states that by the use of oiled wads his fowling-piece never becomes foul inside. He says:—"I use the common wadding (about 4-16ths thick), but I oil so much that when ready I can, by squeezing hard, get a little oil to show itself, and with this I load, carrying the greasy wadding in a tin made to fit the vest pocket, about 4 inches long, $1\frac{1}{4}$ wide, $2\frac{1}{2}$ deep in front, with a curvature to fit the body. This case will hold about 50 wads. Of coarse I use the oil brush about the nipples and locks after shooting."

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INDUSTRY—MANUFACTURES—COMMERCE.

The Horse Rail and the Street Horse.—There is quite a spirited competition going on in the city of Chicago between the omnibus proprietors and those of the street railroads. Each have put their fares at 40 rides for $1 (or 2½ cents each); and the omnibus proprietors have the courage to dare the competition. About 100 new stages, of superior finish, have been put on the routes, and the contest is a lively, cheap and exciting one to the people.

Malleable Iron.—A new and improved method of malleable-izing iron castings is announced in the New York *Tribune* to have been discovered by Professor A. R. Eaton, of this city. It consists in exposing the castings to the contact of oxyd of zinc, as a substitute for the oxyd of iron in the furnace, It is stated that the employment of the oxyd of iron which combines with the excess of carbon in iron castings, when long exposed to a red heat, leaves a spongy residium on the castings, which is obviated by the zinc oxyd, because the zinc is volatile and passes off, leaving the oxygen gas to combine with the carbon in the iron.

City Railroads in Europe.—George F. Train, our "spread eagle" countryman, and author of "Young America," has proposed a system of city railroads for Liverpool on the American plan. In a recent speech, he said:—"The time seems approaching when the introduction of some facilities of this description will be witnesssed in all large European towns. There are five city railroads in New York, operating on a total length of 44 miles, constructed at an aggregate cost of about $5,000,000, which pay dividends of from 6 to 12 per cent, and are alleged to have carried 34,000,000 passengers in the year 1859. At Boston and Philadelphia, also, the plan has long been resorted to, and the busy people of all those cities would, it is believed, view a return to the old condition of traffic with as much surprise as a retrogression from gas to oil." It is to be hoped that the merchant princes of Liverpool will speedily push forward such "internal improvements," under the salutary *training* which they are now undergoing.

American Silks.—The operations of silk-weaving, which had been suspended, have been resumed in Paterson, N. J., by Mr. John Kyle in his silk factory. Several years ago Mr. Kyle made an attempt at weaving, but the demand for his twisted silk yarn was so great that he had to abandon the weaving, and attend wholly to the winding and twisting operations. We can see no reason why as good silk may not be manufactured in America as in England, where great quantities are woven at Spitalfields and other places, from raw silk imported from China.

Water Pipes for Houses.—In a communication to the Boston *Medical and Surgical Journal*, Dr. Windship points out the fearful evils to health attending the use of lead pipes for conveying water into houses for domestic purposes. He says:—"Surely, some method can be devised by which we can enjoy the benefits of modern improvements without such risks to health and life. Let water be introduced into kitchens only through iron, glass, wood or gutta percha. So arrrange the hot-water apparatus that it can only be drawn in the chambers where it is required for bathing, &c.; and once a week (or more frequently, if necessary) let on the water in the wash-room by a lock-faucet, the key of which can be kept in a secure place. Banish forever from the kitchen all lead pipe, copper vessels and copper covers (if the copper is tinned, the tin is soon worn off), and then families may feel comparatively safe from domestic poisoning."

Coal Oil in Trumbull County, Ohio.—Great excitement exists in Mecca, Trumbull county, owing to the discovery of coal oil wells or springs, similar to those found just east of the boundary line between Ohio and Pennsylvania. Last Fall, a farmer in Mecca dug a well, and, at the depth of about 20 feet, struck slate rock, from the fissure in which rock oil oozed into the well in considerable quantities. Since then the well has been further excavated, and greater quantities of oil obtained.

Cheap Coal.—The Baltimore and Ohio Railroad has recently contracted for its coal at 59 cents per tun. The Hudson River Railroad pays $5.50 per tun for the same article, which is estimated to be twice as cheap as wood. The New York Central Railroad uses wood, for which it pays $4 per *cord*.

THE RISE AND PROGRESS OF INVENTIONS.

ADVICE TO INVENTORS.

During the period of Fourteen Years which has elapsed since the business of procuring patents for inventors was commenced by MUNN & Co., in connection with the publication of this paper, the number of applications for patents in this country and abroad has yearly increased until the number of patents issued at the United States Patent Office last year (1859) amounted to 4,538; while the number granted in the year 1845—fourteen years ago—numbered 502—only about one-third as many as were granted to our own clients last year; there being patented, through the Scientific American Patent Agency, 1,440 during the year 1859. The increasing activity among inventors has largely augmented the number of agencies for transactiag such business; and at this time there is scarcely a town of 4,000 inhabitants, but has its patent agent, patent lawyer, patent solicitor, or patent attorney, all of which terms are used to convey the same idea—viz., that their services are offered to the inventor or patentee for a pecuniary consideration.

In this profession, the publishers of this paper have become identified with the universal brotherhood of Inventors and Patentees at home and abroad, at the North and the South; and with the increased activity of these men of genius we have kept apace up to this time, when we find ourselves transacting a larger business in this profession than any other firm in the world. Year after year, we have increased our facilities for transacting patent business, by gathering around us a large corps of the most eminent engineers, draughtsmen and specification writers that can be procured. Among these gentlemen are those who have been connected with the United States and Foreign Patent Offices. The latest engagement we have made is the association with us of **Hon. Charles Mason**, formerly COMMISSIONER OF PATENTS, and favorably known to the Inventor as their friend and advocate. The memory of his acts while holding this high position will be cherished by many an honest inventor with gratitude as long as he lives.

The arrangement made with Judge MASON renders our facilities for prosecuting all kinds of patent business complete, however ample they were before; and without being accused of egotism, we may safely assert that no concern has the combined talent and facilities that we possess for preparing carefully and correctly applications for patents, and attending to all business pertaining to patents, such as Extensions, Appeals before the United States Court, Interferences, Opinions relative to Infringements, &c.

FREE EXAMINATION OF INVENTIONS.

Persons having conceived an idea which they think may be patentable are advised to make a sketch or model of their invention, and submit to us, with a full description, for advice. The points of novelty are carefully examined, and a reply written corresponding with the facts, free of charge. Address MUNN & CO., No. 37 Park-row, New York.

PRELIMINARY EXAMINATIONS AT THE PATENT OFFICE.

The advice we render gratuitously upon examining an invention does not extend to a search at the Patent Office, to see if a like invention has been presented there, but is an opinion based upon what knowledge we may acquire of a similar invention from the records in our Home Office. But for a fee of $5, accompanied with a model or drawing and description, we have a special search made at the United States Patent Office, and a report setting forth the prospects of obtaining a patent, &c., made up and mailed to the inventor, with a pamphlet, giving instructions for further proceedings. These preliminary examinations are made through our Branch Office, corner of F and Seventh streets, Washington, by experienced and competent persons, under the direction of a gentleman who has spent a lifetime about the Patent Office. Over 1,500 of these examinations were made last year through this office, and as a measure of prudence and economy, we usually advise inventors to have a preliminary examination made. Address MUNN & CO., No. 37 Park-row, New York.

CAVEATS.

Persons desiring to file a caveat can have the papers prepared on reasonable terms, by sending a sketch and description of the invention. The government fee for a caveat is $20. A pamphlet of advice regarding applications for patents and caveats furnished gratis on application by mail. Address MUNN & CO., No. 37 Park-row, New York.

HOW TO MAKE AN APPLICATION FOR A PATENT.

Every applicant for a patent must furnish a model of his invention, if susceptible of one; or if the invention is a chemical production, he must furnish samples of the ingredients of which his composition is composed for the Patent Office. These should be securely packed, the inventor's name marked on them, and sent, with the government fee, by express. The express charges should be prepaid. Small models, from a distance, can often be sent cheaper by mail. The safest way to remit money is by draft on New York, payable to the order of Munn & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents; but if not convenient to do so, there is but little risk in sending bank bills by mail, having the letter registered by the postmaster. Address MUNN & CO., No. 37 Park-row, New York.

REJECTED APPLICATIONS.

We are prepared to undertake the investigation and prosecution of rejected cases, on reasonable terms. The close proximity of our Washington Agency to the Patent Office affords us rare opportunities for the examination and comparison of references, models, drawings, documents, &c. Our success in the prosecution of rejected cases has been very great. The principal portion of our charge is generally left dependent upon the final result.

All persons having rejected cases which they desire to have prosecuted are invited to correspond with us on the subject, giving a brief history of their case, enclosing the official letters, &c.

FOREIGN PATENTS.

We are very extensively engaged in the preparation and securing of patents in the various European countries. For the transaction of this business we have offices at Nos. 66 Chancery Lane, London; 29 Boulevard St. Martin, Paris; and 26 Rue des Eperonniers, Brussels. We think we can safely say that three-fourths of all the European patents secured to American citizens are procured through our Agency.

Inventors will do well to bear in mind that the English law does not limit the issue of patents to inventors. Any one can take out a patent there.

Circulars of information concerning the proper course to be pursued in obtaining patents in foreign countries through our Agency the requirements of the different Patent Offices, &c., may be had gratis upon application at our principal office, No. 37 Park-row, New York, or either of our branch offices.

INTERFERENCES.

We offer our services to examine witnesses in cases of interference, to prepare arguments, and appear before the Commissioner of Patents, or in the United States Court, as counsel in conducting interferences or appeals.

For further information, send for a copy of "Hints to Inventors." Furnished free. Address MUNN & CO., No. 37 Park-row, New York.

THE VALIDITY OF PATENTS.

Persons who are about purchasing patent property, or patentees who are about erecting extensive works for manufacturing under their patents, should have their claims examined carefully by competent attorneys, to see if they are not likely to infringe some existing patent, before making large investments. Many persons have been ruined from adopting the "penny-wise and pound-foolish" maxim, when an investment of a few dollars, to have been informed of their rights, would have saved them much anxiety and money. Written opinions on the validity of patents, after careful examination into the facts, can be had for a reasonable remuneration. The price for such services is always settled upon in advance, after knowing the nature of the invention and being informed of the points on which an opinion is solicited. Judge MASON assists in all examinations of this kind.

For further particulars, address MUNN & CO., No. 37 Park-row, New York.

EXTENSIONS OF PATENTS.

Valuable patents are annually expiring, which might be extended, and bring fortunes to the households of many a poor inventor or his family. During the past fourteen years, we have had much experience in procuring the extension of patents; and, as an evidence of our success in this department, we would state that, in all our immense practice, we never lost but two cases—and those were unsuccessful from causes entirely beyond our control.

It is importa t that extension cases should be managed by attorneys of the utmost skill to ensure success. All documents connected with extensions require to be carefully drawn up, as any discrepancy or untruth exhibited in the papers is very liable to defeat the application.

Of all business connected with patents, it is most important that extensions should be intrusted only to those who have had long experience, and understand the kind of evidence to be furnished the Patent Office, and the manner of presenting it. The heirs of a deceased patentee may apply for an extension. Parties should arrange for application for an extension at least six months before the expiration of the patent.

For further information, as to terms and mode of proceedure in obtaining an extension, address MUNN & CO., No. 37 Park-row New York.

ASSIGNMENT OF PATENTS.

The assignment of patents and agreements, between patentees and manufacturers, carefully prepared and placed upon the records at the Patent Office. Address MUNN & CO., at the Scientific American Patent Agency, No. 37 Park-row, New York.

PATENT CLAIMS.

Persons desiring the claims of any invention which has been patented within 14 years can obtain a copy by addressing a note to this office, stating the name of the patentee, and date of patent when known, and enclosing $1 as fee for copying. Address MUNN & CO., No. 37 Park-row, New York.

CAUTION TO INVENTORS.

Messrs. MUNN & CO. wish it to be distinctly understood that they neither buy nor sell patents. They regard it as inconsistent with a proper management of the interests and claims of inventors, to participate in the least apparent speculation in the rights of patentees. They would also advise patentees to be extremely cautious into whose hands they entrust the power to dispose of their inventions. Nearly fifteen years' observation has convinced us that that the selling of patents cannot be conducted by the same parties who solicit them for others, without causing distrust.

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We would inform inventors that their communications are treated with the utmost confidence, and that the secrets of inventors confided to us are never divulged, without an order from the inventor or his acknowledged representative.

TESTIMONIALS.

The annexed letters from the last three Commissioners of Patents we commend to the perusal of all persons interested in obtaining Patents:—

Messrs. MUNN & Co.:—I take pleasure in stating that while I held the office of Commissioner of Patents, MORE THAN ONE-FOURTH OF ALL THE BUSINESS OF THE OFFICE came through your hands. I have no doubt that the public confidence thus indicated has been fully deserved, as I have always observed, in all your intercourse with the Office, a marked degree of promptness, skill, and fidelity to the interests of your employers. Yours, very truly,

CHAS. MASON.

Immediately after the appointment of Mr. Holt to the office of Postmaster-General of the United States, he addressed to us the subjoined very gratifying testimonial:—

Messrs. MUNN & Co.:—It affords me much pleasure to bear testimony to the able and efficient manner in which you discharged your duties as Solicitors of Patents while I had the honor of holding the office of Commissioner. Your business was very large, and you sustained (and, I doubt not, justly deserved) the reputation of energy, marked ability, and uncompromising fidelity in performing your professional engagements. Very respectfully,

Your obedient servant, J. HOLT.

Messrs.. MUNN & Co.—Gentlemen: It gives me much pleasure to say that, during the time of my holding the office of Commissioner of Patents, a very large proportion of the business of inventors before the Patent Office was transacted through your agency, and that I have ever found you faithful and devoted to the interests of your clients, as well as eminently qualified to perform the duties of Patent Attorneys with skill and accuracy. Very respectfully,

Your obedient servant, WM. D. BISHOP.

MODELS BY EXPRESS.

Inventors sending models to our address should always enclose the express receipt, showing that the transit expenses have been prepaid. By observing this rule we are able, in a great majority of cases, to prevent the collection of double charges. Express companies, either through carelessness or design, often neglect to mark their paid packages, and thus, without the receipt to confront them, they mulct their customers at each end of the route. Look out for them!

It would require many columns to detail all the ways in which the inventor or patentee may be served at our offices. We cordially invite all who have anything to do with patent property or inventions to call at our extensive offices, 37 Park-row, New York, where any questions regarding the rights of patentees will be cheerfully answered. Communications and remittances by mail, and models by express (prepaid), should be addressed to MUNN & CO., No. 37 Park-row, New York.

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ISSUED FROM THE UNITED STATES PATENT OFFICE

FOR THE WEEK ENDING FEBRUARY 28, 1860.

[Reported Officially for the SCIENTIFIC AMERICAN.]

*** Pamphlets giving full particulars of the mode of applying for patents, size of model required, and much other information useful to inventors, may be had gratis by addressing MUNN & CO., Publishers of the SCIENTIFIC AMERICAN, New York.

27,263.—Daniel Bach and Kasimir Krenkel, of New York City, for an Improved Folding Bedstead:

We claim the application and use of a self-acting catch, C, to secure and hold the side rail, B, in the proper place, when the bedstead is put up for use, in the manner substantially as described.

27,264.—Joseph Bissinger, of New York City, for a Bracelet Fastening:

I claim the screw, e, in combination with the spring latch, or catch, n, for the purpose of preventing an accidental opening of the bracelet or necklace, in the manner substantially as described.

27,265.—G. M. Bligh, of New York City, for an Improvement in Paint Cans:

I claim the employment, in combination with the can, A, of the swivel catches, E, when constructed and arranged as set forth, for the purpose specified.

[The object of this invention is to provide a simple and efficient device for fastening down the covers of cans for putting up paints and other substances, which device allows at the same time the opening of said can without the aid of the soldering iron and without injury to any part of the can.]

27,266.—H. F. Bond, of Waltham, Mass., for a Reading Card:

I claim the combination of the card, the elastic cord, and the paper knife, for the purposes and substantially after the manner above described.

27,267.—John Bryner, of Peoria, Ill., for an Improved Counting-house Calendar:

I claim an arrangement of figures, pins, knobs, or other fastenings (for memoranda) on a board, or other material, together with cases for movable names of the months, divided into spaces in which to place any required memorandum or appointment under its proper date, for the purpose of facilitating business men and others, in keeping any and all appointments or business of any description to be attended to at any given time.

27,268.—Joseph M. Butler, of Oxford, Miss., for an provement in Implement for Boring Wells:

I claim first, The employment of wire rope for operating the auger, as set forth.

Second, I also claim making the shaft of the auger hollow, as set forth.

27,269.—Wm. Campbelt, of Jersey City, N. J., for a Photographic Plate Shield:

I claim the revolving plate frame, C, substantially in the manner and for the purposes set forth.

27,270.—J. T. Chabot, of Buffalo, N. Y,, for an Improved Steering Apparatus:

I claim the combination and arrangement of the steering wheel, F, chain wheels, F C H N, double thread screw, M, endless chains, K L, and screw swivels, v v, and as connected to tiller, substantially for the purpose specified.

27,271.—Joseph Codling, Jr., and John McCunniff, of Fairbanks, Iowa, for an Improvement in Feed Water Heaters for Steam Boilers:

We claim the employment, in combination with hollow grate bars, of a system of tubes, B B, and cylinders or boxes, C C, and connecting pipes, D D', the whole arranged substantially as specified.

[This invention consists in the employment, in combination with hollow grate bars of copper tubes passing longitudinally through the said bars and connecting with transversely arranged cylinders or boxes which are arranged below them at each end, and provided with connections to the feed pump and tank.]

27,272.—L. T. Conover, of Philadelphia, Pa., for an Improvement in Vapor Lamps:

I claim, first, The vertical sediment tube, and its cup, as arranged in relation to the conducting tube and reservoir and valve, as set forth.

Second, I claim the vaporizing chamber, in the horizontal conducting tube, as it is connected with the heating head, n, having its wicked extension in the conducting tube, and as it is arranged in relation to the feeding tube and burner as described.

27,273.—Geo. Copeland, of Gray, Me., for an Improvement in Seeding Machines:

I claim, first, The distributing fan or throwing device, F, when constructed in the peculiar form shown and described

Second, The arrangement and combination of the throwing device, F, hopper or seed box, A, bag, B, and screw, D, as and for the purposes shown and described.

[The object of this invention is to obtain a simple, portable and economical implement that may be carried by the operator, and manipulated with the greatest facility in order to sow seed broadcast in a more even manner than can be done direct by the hand.]

27,274.—L. B. Corbin, of Dryden, N. Y., for an Improvement in Grain Separators:

I claim making the spreading aprons adjustable, so that the degree of inclination of each and any of them may be varied at pleasure for the purposes before set forth.

I also claim the adjustable frontispiece, H, of the spreading chamber, in combination with the partition, K, the whole arranged to operate as specified, for the purposes set forth.

27,275.—W. G. Crutchfield, of Dayton, Ohio, for an Improvement in Operating Governor Valves for Steam-engines:

I claim the arrangement of the sleeves, E and F, pinion, G, screw shaft, K, tubular arm, O, lever, I. wheels, s and x, and cam cylinder H, when the same are used substantially as and for the purpose specified.

27,276.—A. W. Cunningham, of West Middleton, Pa., for an Improved Churn:

I claim the combination of the spring dasher, worked by a cam and constructed as described, of longitudinal strips, so set as to present their angular edge to the cream as they strike it, with a box deeper at one end than at the other, to accommodate the stroke of the dasher.

27,277—J. G. Dodge, of St. Louis, Mo., for a Tent Frame:

I claim combining the legs, c' c c c, with the beam, B, not per se, but when the said legs are made with oblong holes in them, so as to open and shut and close up alongside of the said beam, so as to form a straight fall, all substantially as described.

27,278.—N. S. Dodge, of Indianapolis, Ind., for an Improvement in Horse-powers:

I claim the combination and arrangement of the peculiar shaped right angle braces, c c, with the walking cleats, B, and the tension rollers, A A, substantially as set forth and for the purpose declared.

27,279.—H. W. Dopp, of Buffalo, N. Y., for an Improvement in Sewing Machines:

I claim, first, The combination of the stationary bobbin case, the hook stretchers, and the thumb and finger, or their equivalents, so arranged as to cross the needle thread after it has been passed over the bobbin, so that the needle may pass down into this cross or loop of its own thread, at each subsequent downward movement, for the purpose of running the under thread in a spiral form, through a loop stitch, substantially as shown.

Second, The employment of the yielding tooth, d, in combination with the vibrating bar, k, when the same is used as a relief feed, substantially as specified.

27,280.—E. P. Emerson, of Blairsville, Pa., for a Composition for Paint:

I claim the composition of ingredients and mode of manufacturing the fire and waterproof paint, substantially as described.

27,281.—John Gordon, of New London, Conn., for an Improvement in Watches:

I claim the employment, in combination with the elongated toothed curb lever, b, of the arbor, f, when the said arbor passes through the dial potence plate and cock, and is provided at one end with a pinion, e, which gears with the teeth of the curb lever, and at the other end with a hand, z, which moves over the surface of a recess, h, in the dial, which recess has a graduated scale, all as and for the purpose shown and described.

[This invention was fully described and illustrated on page 64 of the present volume of our paper.]

27,282.—Wm. D. Grimshaw, of Newark, N. J., for a Fire Alarm. Patented in England December 29, 1858:

I claim, first, The arrangement of the elastic diaphragm, B, in the air-tight vessel, A, in combination with the index, F, or its equivalent, constructed and operating substantially as and for the purpose specified.

Second, Combining with the vessel, A, and index, F, a quadrant, H, or its equivalent, and alarm bell, L, or its equivalent, substantially in the manner and for the purpose described.

27,283.—Samual Adams, of Toulon, Ill., for an Improvement in Mole Plows:

I claim the construction of mole plow described, whereby the earth in the groove at the base of the drain is excavated and conveyed to the sides or top of the drain, substantially as and for the purposes set forth.

27,284,—Samuel Gillespie, of New York City, for an Improved Folding Bedstead:

I claim the combination and arrangement of the head and foot boards, c c, hinged to side rails, A A, and dovetail, B B, substantially as and for the purpose specified.

27,285.—George L. Griffin and J. H. Carper, of Dallas City, Ill., for an Improvement in Mole Plows:

We claim constructing the sword with an advancing and receding angle which converge in a point in advance of the point of the mole, and directly above it, in combination with the said mole, in the manner and for the purposes fully described.

27,286.—Theodon S. Harris, of Boston, Mass., for an Apparatus for Cleaning Tumblers, &c.:

I claim, first, An apparatus for washing and cleansing tumblers and other vessels, so arranged as to receive and hold the said tumblers, &c., in position; and having such an automatic motion, of any proper nature, imparted to it by any suitable machinery or means, as to bring the vessels to be cleansed in contact with, and expose them to, the action of a body or jet or shower of cleansing liquid, as set forth.

Second, The apparatus described and shown in the drawings; the same consisting essentially of a revolving platform having compartments and partitions for the reception and holding of the tumblers, &c., and actuated by the force of a jet or shower of water, or other liquid, as set forth.

27,287.—Henry C. Haskell, of Marshall, Mich., for a Pen Rack, Cleaner and Pencil-sharpener:

I claim, first, The use of the revolving brush, G, in combination with the two wheels, E F, and crank, C, substantially as and for the purposes described, when connected with a pen rack as specified.

Second, Attaching to the end of the revolving spindle, S, any convenient pencil-sharpener, D, combined with an open box, J, to receive the shavings, as set forth.

27,288.—Ureli C. Hill, of Jersey City, N. J., and Henry J. Newton, of New York City, for an Improvement in Musical Instruments:

We claim, first, The use of cast metallic forks in the place of forged ones previously used, when the same shall be arranged and operated as described.

Second, The combination of the strings, o, sounding-board, P, cells, A A, and forks, C C, when arranged and operated as set forth.

Third, The combination of the over key, H, with the under key, N, for the purpose of extending the action of the back ends of the under keys, when the same shall be arranged and operated as specified.

Fourth, Casting the forks, C C, in a cylindrical form, for the purpose of adding strength of vibration to the cells, A A.

Fifth, The extension of the fork prongs, F F, by soldering or riveting soft metal, G, to the same, as described, for facilitating the tuning of the same.

27,289.—J. W. Hoard and Thomas A. Searle, of Providence, R. I., for an Improved Nail Plate-feeder:

We claim, first, The employment, in combination with an apparatus for conveying and feeding the plates toward the cutters, of a box containing a pile of plates, the lower one of which is, by an automatic action, discharged sideways from the box and delivered to the feeding apparatus in a direction transverse to the feed movement as often as a new plate is required.

Second, The arrangement of the feeding apparatus, or that portion of it which holds the plate and moves it forward, to swing upward and downward on trunnions or with a lever-like movement, substantially as described.

Third, The barrel or conductor, F, having attached the tongs and feed rollers and furnished with a toothed wheel or sector, N, through which it receives a movement back and forth on its axis, and a cam, Q, through which it receives a longitudinal movement back and forth, as described.

Fourth, The arrangement of the sector, O, and cam, P, in combination with the wheel or sector, N, on the barrel, substantially as described.

Fifth, The combination with the eccentric groove, I, in the cam, Q, of a lever-like bar, R, furnished with a pin or projection, n, and having applied to it a spring, p, substantially as described.

Sixth, In combination with feed rollers, applied as described and furnished with ratchets, we claim the pawls, q q, headed rods, S, and ring, t, applied in relation to the barrel or conductor, F, and the cylinder, E, or bearing of said barrel or conductor, to operate the rollers, substantially as described.

Seventh, Controlling the action of the cam shaft, D, by which the plates are discharged from the box, B, by the action of the plates passing through a recess, 7, in the barrel or conductor, F, substantially as described.

[Applications for foreign patents on this important invention are pending, which precludes a further description at present.]

27,290.—W. W. Howell, of Columbus, Miss., for an Improvement in Cotton Gins:

I claim the arrangement and combination of the trashing and preparing cylinder, C, the folding top, L, the conveyor, g g', with the cotton gin, in the manner and for the purpose described.

I also claim the combination of a cylinder of ginning saws, m m, the two brushes, F G (one a dirt brush, and the other a stripping brush), the transverse shaft or air flue, H n, and the longitudinal dirt discharge flue, I, substantially as and for the purposes set forth.

[This cotton gin has a trasher combined with it, and also a mote brush revolving in a reverse direction to the stripping brush. The trasher cleans very dirty cotton before it passes to the gin saw. The saws gin or deprive the partially cleaned cotton of the seed; a conveyor carries off the seed. The cotton, after being ginned, is carried through the slitted breast, and is met by a rapidly-revolving mote brush, which whips, with an upward action, the motes or imperfect seed out of the cotton while it is straddling the saw teeth. The motes having been removed, they escape with the current of air drawn in through a draft spout by the motion of the brush; and while this is occurring, the perfectly cleaned cotton is being stripped from the saws, and discharged into the receiver. This machine, as a whole, is certainly very complete, and we are informed, on good authority, that it operetes very perfectly.]

27,291.—John S. Huggins, of Timmonsville, S. C., for an Improvement in Seed Planters:

I claim, first, The combination, with a series of discharge exits, of the sesies of shield plates, e, adjustable cut-offs, o, and guiding spout, C; the whole constructed and operating as specified for the purpose set forth.

Second, The curved furrow-former, F', and shield plate, i, in combination with the rotating seed drum, B, guiding spout, C, and shields, e; the whole constructed and operating as specified for the purpose set forth.

Third, The arrangement of the drum, B, with its wheel heads, A, with the continuous frame piece, d, handles, D, and furrow-former, F F'; the whole constructed and operating as specified for the purposes set forth.

27,292.—L. D. Hunt, G. R. Shippey and B. B. Hawse, of Morrisville, Vt., for an Improved Washing Machine:

We claim the oscillating rubber, R, performing the double function of a rubber and of turning over the clothes, in combination with the square box, B, having the interior ribs, r, and operated by its partial revolution on journals, a, substantially as and for the purposes set forth.

27,293.—Henry Johnson, of Washington, D. C., for an Improvement in Vapor Lamps:

I claim, first, The use of straight pipes, B and C, for conveying the fluid to the heater or generator, A, and for conveying the vapor or gas from heater, A, to burner, D, in vapor gas-burners, operating as described and for the purposes set forth.

Second, I claim the heater or generator, A, constructed as described, for conveying the heat to the fluid in the rear of the flame, operating as set forth and described.

Third, I claim placing the screw plugs, b and a, above and in right lines with the pipes, B and C, as described.

Fourth, The burner, D, constructed and operating as set forth and described, for the use of vapor gas-generators.

27,294.—Henry Isham, of New Britain, Conn., for an Improvement in Locks:

I claim the wheel on the key shaft having a rotary movement and a longitudinal movement in the direction of its axis, as described, in combination with the series of tumblers and the series of interposed wheels, substantially as described and for the purpose described.

I also claim, in combination with the series of wheels which actuate the tumblers, and with the wheel on the key shaft, the cylinder on the key shaft and the locking segment, or either of them, the former operating as described, to lock and hold the said wheels in their normal position, and they, when out of their normal position, acting as stops to prevent the inward movement of the said cylinder, as described, and the latter operating, as described, to lock the said wheels in the position in which they are set by the wheel on the key shaft, as described.

I also claim making the bolt with one or two recesses in its edge, to fit the periphery of the cylinder on the key shaft, and with a cogged and non-cogged fillet by the side, in combination with the actuating or cog wheel and cylinder on the key shaft, and the space between the two, and the longitudinal movement of the wheel and cylinder, as described, whereby the cylinder locks the bolt until, by the longitudinal movement, the cylinder is removed out of the path of the bolt, and the wheel is brought into gear with the rack on the bolt to operate it as described.

27,295.—Jasper Johnson, of Geneseo, N. Y., for an Improved Blind Operator:

I claim the curved guides, g g', and bent rod, R, passing through the window frame, in combination with the blind and window frame, when said rod performs the double function of operating and fastening the blind, as set forth.

27,296.—J. J. Kendall, of Corinth, Miss., for an Improvement in Looms:

I claim combining the cam shaft for operating the harness treadles with the lay, by means of a wheel, F, with teeth on each side, pawls, G G', a lever, H, and a rod, J; the whole applied and operating substantially as described for the purpose specified.

[This invention consists in certain mechanism whereby the vibration of the lay is made to impart motion to the harness at the proper time; such mechanism constituting a very suitable harness motion for hand looms, enabling the weaver to effect all the operations by merely swinging the lay. The loom, with this mechanism applied, may be converted into a power loom by the attachment of suitable means for driving the lay by power.]

27,297.—Edward C. Knight, of Philadelphia, Pa., for an Improvement in Couches for Railroad Cars:

I claim dividing a double couch, so constructed as to fold up by means of double hinged rods against the ceiling of a car, into two single couches by making a third joint in the rods, so that either one double couch or two single couches may be formed, as desired, substantially as set forth.

27,298.—Richard F. Laper, of Philadelphia, Pa., for an Improvement in the Construction of Ships:

I claim constructing steamships, war and other vessels, in part of wood and part of "composition," as described; the parts of composition being formed with the recesses and connected to the wood, as set forth.

27,299.—Wm. C. Lutz, of Jacob's Church, Va., for an Improved Folding Bedstead:

I claim the arrangement of the peculiarly-mortised and tenoned side and end rails, screw-doweled legs, screw-tapped posts and wedge keys, in the manner and for the purpose described.

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27,300.—Wm. P. Martin, of Salem, Mass., for an Improvement in Machines for Finishing Leather:

I claim combining the hand or tool-holder, M, and its tool, i, spring presser or plate, N; the same being applied and made to operate therewith substantially in the manner set forth.

27,301.—Thos. J. Mayall, of Roxbury, Mass., for an Improvement in Razor Straps:

I claim, as a new article of manufacture, an india-rubber or gutta-percha razor strap, the hone side of which is formed of emery, sand or other suitable gritty substance or substances, incorporated with india-rubber or gutta-percha, substantially as described.

27,302.—Joseph B. McEnally, of Clearfield, Pa., for a Paper and Letter File:

I claim the cylinder, A, provided with the hook or hooks, B, and spiral terminals, a, in combination with the cords or wires, d e; being arranged substantially as and for the purpose set forth.

[This invention consists in attaching papers or letters to a cylinder by means of a hook or hooks secured thereto, in such a way that they may be passed through the margins of the papers or letters at the folps; and using in connection with said hook or hooks, cords or rods —one passing inside of each paper or letter, and leaving their ends attached to the ends of a cylinder, and retained in proper position by means of spiral terminals.]

27,303.—Jacob Neimeyer, of Hamilton, Ohio, for an Improvement in Fastening Saw Handles:

I claim the compound saw handle described, the same consisting of the combination of the slotted rod, B, with the parts, C and D, of the handle, and the nut, E; all constructed, arranged and operating as and for the purpose specified.

27,304.—John H. Nevin, of Ogsdenburgh, N. Y., for an Improvement in Devices for Opening and Closing Gates:

I claim arranging a gate or door with a double spring hook, B, in combination with a double hand lever, C, and with posts, D and E, to operate substantially in the manner and for the purpose set forth.

[The object of this invention is to fasten a gate or door as well when the same is shut as when it is opened, so that the same, when it is exposed to the action of the wind, is not thrown about and injured. A double spring hook, with a double hand lever and two posts, serve to enable the door to fasten itself as well when it is opened as when it is closed.]

27,305.—Mark S. Palmer, of New Bedford, Mass., for an Improvement in Fishing Reels:

I claim the reciprocating line guide, D, applied to the reel, and operated from the gearing connected with the crank, e, by the right and left screw shaft, B, and pivoted nut, E, substantially as set forth.

I further claim the arrangement of the pinions, j k, socket, n, and bar, g, substantially as shown, to admit of the ready throwing in and out of gear of the shaft, B, with the wheel, c, as set forth.

[This invention consists in the employment or use of a traveling or reciprocating line guide attached to the reel, and operating automatically and in such a way as to cause the line, as it is wound up, to be adjusted evenly on the shaft of the reel.]

27,306.—G. W. Parrott, of Lynn, Mass., for an Improvement in Sole-cutting Machines:

I claim the bar, J, attached to the cutter head, in combination with the slot, d, or its equivalent, operating as set forth, to govern the motions of the cutter, for the purpose specified.

27,307.—Charles B. Parsons, of Burr Oak, Mich., for an Improvement in Converting Reciprocating into Rotary Motion:

I claim the combination of the grooves, a a, upon the sides of the rack, F, with the eccentric flange, C, at the side of the wheel, H, when the two are constructed and arranged in the particular manner specified, and for the purpose set forth.

27,308.—Silas G. Randall, of Worcester, Mass., for an Improvement in Pumps:

I claim the union of the combined piston and valve chambers, G and H, with the smaller delivery chamber, B, by means of the eduction tube, F, when the piston rod, D, of the pump is conducted from the latter to the former through said eduction tube, the whole constructed and aranged substantially in the manner set forth.

27,309.—John H. Redstone and Albert E. Redstone, of Indianapolis, Ind., for an Improvement in Shingle Machines:

We claim the cross-grooved wheel, F, follower, G, lever, H, when used in connection with the grooved cam, B, the slotted bar, D, knife plate, E, and table rest, M, or their equivalents, as set forth.

27,310.—Lawrence Reid and John Rogers, of New York City, for an Improvement in the Manufacture of Glue:

We claim the rapid preparation of glue and gelatine of better quality and increased quantity from skins and sinews, by the method described.

27,311.—John Richardson, of New York City, for an Improved Pen and Pencil Case:

I claim the combination of the spirally slotted tubes, D F, longitudinally slotted tubes, B G, extension tube, C, and shell, A, arranged to operate as and for the purpose set forth.

27,312.—Alonzo R. Root, of Canton, Mo., for an Improvement in Seeding Machines:

I claim, first, The employment of the hinged screen, S, within the hopper, in combination with the agitator, R, as and for the purpose shown and described.

Second, The arrangement of the feed-regulating screw, M, sliding block, f, stem, c, block, b, and hollow shaft, K, as and for the purpose shown and described.

[This invention and improvement in hand-feeding machines consists, first, In arranging in one end of a cylinder of a suitable dimension, a hollow, revolving triangular head, with openings in the angles of the same for the full escape of the seed, and upon which is secured radial tubes for distributing the seed broadcast as the head is rotated by a shaft passing longitudinally through the center of the cylinder. Second, In the arrangement of a gage plate capable of adjustment to or from the end of the cylinder through which the seed flows, so as to regulate the flow of seed into the triangular head; and in connection with this adjustment is a set gage for ascertaining the quantity of seed sown per acre. Third, In the interposition of an agitator in the throat of the seed hopper, for preventing the same from getting choked when sowing oats.]

27,313.—Thomas Sault, of Seymour, Conn., for an Improved Air Trap for Steam Engines:

I claim the air trap composed of a valve of hard vulcanized india-rubber, constructed and applied to operate, substantially as described, between two opposite seats and orifices in a box of metal or other material, whose expansibility by heat is less than that of the valve.

27,314.—Wm. Sharp, of Catharine, N. Y., for an Improvement in Boxes of Carriage Wheels:

I claim construct ng the wheels of carriages and other vehicles with reversed beveled bearings and boxes of corresponding form, the outer of said bearings having the greater inclination of the two, substantially as and for the purpose set forth.

27,315.—Samuel J. Shaw and H. J. Batchelder, of Marlborough, Mass., for an Improved Lantern Carrier:

We claim the lantern carrier, constructed as described, and for the purpose of supporting a lantern against the breast of a person, and having both arms free to be moved in any direction.

27,316.—Andrew L. Simpson, of Durham, N. H., for an Improvement in Reefing Sails:

I claim the application of the connected blocks, or equivalents, to the sail and the topsail yards, so as to roll about the yard with the sail, substantially in manner and for the purpose as specified.

I also claim the adjustable clasp, W, made in two parts, and provided with a screw or screws for connecting them to the sail and adjusting them with reference to the guide rope, as described.

I also claim the application of the covering strip, X, to the topsail and its opening, in such manner as to enable the said strip to be slid up and down on the sail and to or near the foot thereof, in manner substantially as described.

27,317.—Samuel Solliday, of Sumneytown, Pa., for an Improved Safety Casing for Steam Boilers:

I claim the encasing of marine steam boilers within a chamber of sufficient strength to withstand the effect of explosion in all parts except its top, as set forth.

27,218.—James Stilley, of Cincinnati, Ohio, for an Improved Bread-slicer:

I claim the combination of the abutment board, A', knife, C, clearer, e, and adjustable gage, F, constructed, arranged and operating substantially as and for the purposes set forth.

27,319.—Orson W. Stow, of Plantsville, Conn., for an Improvement in Bending Sheet Metal:

I claim, first, Making the folding bar commonly used in such machines in two parts, f and i, one part, i, being adjustable in respect to the folding plate, e, by means of set screws, n, or other equivalent means, so as to form a close or open lock for joining two pieces of metal plate or closing around a wire, substantially in the manner described.

Second, I claim arranging the griping jaw, S, with the folding bar, f and i, in such a manner that, on motion being given to the folding bar, f, on its axis, g, of the griping jaw, S, is made to close on the folding plate, e, and at the same time carry along with it the folding bar, f, into such a position as will bring its axis, g, of motion nearly into a line with the edge of the folding plate, e, thereby placing the folding plate, f and i, in position to be turned over on to the folding plate, e, necessarily and simultaneously with the motion of the folding bar, f and i, on its axis, g, substantially in the manner as described.

Third, I claim the bedplate proper, a a', to which is secured the folding plate, e, in combination with the hinged frame, b, having journal boxes, d, and griping jaws, S, the folding bar, f and i, fixed or adjustable, and having journals, g, cams, o, arranged and operating together substantially in the manner as and for the purpose described.

27,320.—Geo. C. Taft, of Worcester, Mass., for an Improved Drill:

I claim the arrangement and application of the support piece, S, the slide rod, I, the drill shaft and the pawl-operating mechanism, as specified, whereby, by the said support piece, not only the vibrating lever, K, of the pawl, but other mechanism, and particularly an arbor, R, and an internal gear, Q, can be sustained and employed to advantage, as explained.

I also claim the arrangement and application of the cammed post, V, or its equivalent, with respect to the puppet, a, the ratchet, O, and pawl, N, as described.

27,321.—Joseph C. Tucker, of New York City, for an Improvement in Defecating and Decolorizing Saccharine Juices:

I claim, first, The application, in the refining of sugar or saccharine liquids, for decolorizing or defecating the same, of hydrated alumina, when the same is prepared by decomposing a solution of sulphate of alumina by means of cream of lime, as set forth.

Second, In combination with the foregoing, I claim the method described of separating gypsum from the hydrated alumina by agitating the same with water and allowing the former to subside, and by drawing off the supernatant hydrate of alumina, substantially as set forth.

27,322.—Silas O. Vaughn, of De Kalb, Ill., for an Improvement in Plows:

I claim the arrangement of the rod, J, beam, F, standard, I, taper hole, e, strap, G, screw, a, slots, b, eye, H, plates, c c, handle, D, and landside, A, as shown and described.

[This invention consists in a novel manner of attaching the beam of the blow to the landside handle and also to the standard, whereby the beam, by a very simple means, is rendered capable of being adjusted both laterally and vertically to regulate the width and depth of the furrow as may be desired.]

27,323.—Wm. A. Vertrees, of Winchester, Mo., for an Improvement in Harvesters:

I claim the combination with the slotted fingers, d d, of a cutter having on the same blade a double row of teeth, the upper row having its cutting edges in the plane of the upper surface of the blade, and the teeth in the lower row having their cutting edges in the plane of the lower surface of the blade, and being placed intermediate to the teeth in the upper row, as described, in the construction of reaping machines.

27,324.—Augustus Watson, of London, Ohio, for an Improvement in Lining Underground Drains with Cement:

I claim, In combination with a mole for forming an underground drain, a tube for conveying cement or other plastic lining material down to the drain, in such manner that it may be spread by a trowel-ing mole upon such parts of the drain as may be desired, substantially as described.

27,325.—Wm. D. Walker, of Livonia, N. Y., for an Improvement in the Method of Regulating Wind Wheels:

I claim the combination and arrangement of the balls, g, compound sliding ratchet bar, k, hand regulator, s r and o, as described, with the sails, C, substantially in the manner and for the purposes set forth.

27,326.—Peter Weiler, of New York City, for an Improved Machine for Cutting Veneers:

I claim, first, The use and employment of a rotary log-carrier for the purpose of cutting veneers, substantially as specified.

Second, The combination of a rotary log-carrier with a knife, in such a manner that the knife may either be moved towards the rotary log-carrier, or the knife remain stationary and the rotary log-carrier moved towards the knife, for the purpose specified.

Third, The combination of a rotary log-carrier and the knife when a lateral motion is given to the knife, or a lateral motion is given to the rotary log-carrier, to produce a drawing cut upon the wood, for the purpose of facilitating the cutting operation.

Fourth, The arrangement and combination of a rotary log-carrier with a tank, or its equivalent, containing a suitable fluid and capable of being heated and kept hot, and causing the logs to pass through said heated liquid during their revolution, in the manner and for the purpose as described.

Fifthly, Combining with the knife the gage bar, Q, in the manner and for the purpose substantially as described.

27,327.—Franklin W. Willard, of New York City, assignor to himself and E. G. Allen, of Boston, Mass., for an Improvement in Apparatuses for Distilling Coal Oil:

I claim the arrangement of a series of valves and ports, in combination with the revolving retort, so operating as to always leave open one or more of the said ports at the upper portion of the retort, and keep the remaining ports at the lower portion thereof closed, substantially as described and for the purpose specified.

27,328.—Thomas Bell (assignor to himself and C. Godfrey Gunther), of New York City, for an Improvement in the Construction of Vessels:

I claim the combination of the locust treenails, c, and wedges, d, with the inboard planking or frame, E, and outboard planking, F, when the apertures which receive the treenails are made tapering in form, and the ends of the nails split and countersunk, as shown and described, for the purpose set forth.

[This improvement in constructing vessels provides for securing two skins together in such a way that the hull will be more solid and firm and less liable to injury from the straining and concussions to which vessels are frequently subjected. The plan will be fully understood by the above claim.]

27,329.—Wm. Berg (assignor to Nestor Houghton), of New York City, for an Improved Wardrobe Bedstead:

I claim the arrangement of the cams, 16, supporting ledges or side bearings, 18, pins or axes, 17, slotted guides and bearing boxes, 19, arranged in connection with each other and with the bed frame and case as described—the whole being constructed substantially as and for the purpose set forth.

27,330.—Charles J. Bradbury, of Boston, Mass. assignor to Paul P. Todd, of Blackstone, Mass., for an Improved Bell Pull:

I claim the arrangement of the spring, C, the knob, A, and nut, D, the shank, a, the screw, b, and the lever, E, substantially as and for the purpose specified.

27,331.—Joseph G. Fuller (assignor to Stephen Halstead, Jr.), of Brooklyn, N. Y., for an Improved Composition for Painting the Bottoms of Vessels, &c.:

I claim the compound of brimstone, tar, rubber, verdigris, and oil, substantially in the proportions and for the purposes specified.

57,332.—John B. Jones, of Williamsburg, N. Y., assignor to himself, S. W. Waldron, Jr., of Brooklyn, N. Y. and F. F. Hall, of Boston, Mass., for an Improvement in Lanterns:

I claim the combination of the perforated angle strips, E, with the corrugated, perforated corner pieces, C, guards, G, loops or eyes, b, vertical rods and glasses, D, as and for the purpose herein shown and described.

[This invention consists in cutting or punching suitable slots through angular corners of the uprights or frames for holding the glass plates of the lantern at suitable points for receiving the guard wire; and in securing the wire or wires at said points around the lantern and to the said uprights by passing a suitable wire rod or rods through eyes or loops which are previously formed at those points upon the guard wire to be attached to the uprights, which loops project through the slots before mentioned.]

27,333.—Robert McLardy (assignor to W. McCully & Co.), of Pittsburgh, Pa., for an Improvement in Tools for Forming the Necks and Orifices of Glass Bottles:

I claim making the lugs and the plugs of cast iron instead of steel, for the purposes before described.

27,334.—Henry D. Musselman (assignor to himself and Wm. D. Sprecker), of Lancaster, Pa., for an Improved Meat-chopper:

I claim the series of independent springs, M, operating separately on the handles, N, of the choppers, O, in combination with the double removable cross-pieces, K L, between which they are held, and the adjusting thumb-screws, X, together with the square-headed and screw-ended pivot rod or bolt, I, with its screw-threaded and handled bar, P, as also the eye-chopper handles, N, when combined in the manner set forth, for the purposes specified.

27,335.—John L. Rowe (assignor to himself and R. F. Clow), of New York City, for an Improved Policeman's Club:

I claim the employment or use of a sheath, B, applied to or fitted on a policeman's club, A, substantially as and for the purpose herein set forth.

27,336.—Henry A. Seymour (assignor to F. E. Darrow and Wm. Webster), of Bristol, Conn., for an Improved Thermostat:

I claim forming a connection from the long end of the lever, f, to and around the pointer spindle, k, to the end of the tension spring, l, substantially in the manner as and for the purpose described.

Second, I claim the employment of the button, e, upon the end of the ring-shaped metallic bar, a b, to nicely adjust the action of said bar upon the pointer, n, through the lever, f, connection, o, spindle, k, and spring, l, arranged and operating substantially as described.

27,337.—Samuel La Forge, of Cleveland, Ohio, for an Improvement in Water-proof Leather Goods:

I claim the article of manufacture herein named, prepared from the undressed skins, exposed to heat, coated with the charged leather solution, and then subjected to the vulcanizing process, as herein set forth.

RE-ISSUES.

Wheeler & Wilson Manufacturing Company, of Connecticut, assignees, through mesne-assignments, of Allen B. Wilson, of Waterbury, Conn., for an Improvement in Sewing Machines. Patented Aug. 12, 1851:

I claim, first, In combination, an eye-pointed needle carrying one thread, a hook properly shaped and moved, and a bobbin supporting and giving off a lower thread; the combination, as a whole, being substantially such as specified, and acting to make stitches under the mode of operation substantially as hereinbefore described.

Second, The combination of a hook so shaped and moved as to spread a loop sufficiently to surround a bobbin, with a bobbin acting as specified; the combination being substantially such as recited hereinbefore, and acting so that a loop is seized, spread and released with a bobbin thread inclosed in it and then drawn up tight by the hook.

Third, I claim a revolving hook so shaped as to operate substantially in the manner specified on loops of needle thread.

Fourth, I claim a hook so shaped and moved as to spread a loop substantially in the manner set forth, in combination with an eye-pointed needle actuated by an eccentric or equivalent motion.

Fifth, I claim feeding the material to be sewed, step by step, by an instrument operating and constructed substantially as described for the purposes specified, in conjunction with a presser foot or surface governed by a yielding force such as described.

Sixth, I claim a spring or yieding clamping surface when combined with another surface so as to grasp cloth between them, and also with a feeding instrument which is out of contact with the cloth when it is thus clamped; the operation being such that the cloth remains clamped substantially in the manner and for the purposes specified, while the feeding instrument is out of contact or engagement with the cloth.

Seventh, I claim arranging a hook that operates substantially in the manner specified in such relative position to a table for supporting cloth, and to an eye-pointed needle, that the former shall extend loops of needle thread in planes perpendicular, or nearly so, to the plane of the cloth or material to be sewed, substantially as specified.

And lastly, I claim a horizontal shaft arranged beneath the platform or table of the machine by which are actuated the needle, the hook, and the feeding instrument, in combination with a hook which moves in a vertical plane, or nearly so; the combination being substantially such as described.

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Wheeler & Wilson Manufacturing Company, of Connecticut, assigness, through mesne-assignments, of Allen B. Wilson, of Waterbury, Conn., for an Improvement in the Process of Forming Stitches by Machinery. Patented Aug. 12, 1851:

I claim the mode or process substantially as hereinbefore specified, of making a double thread stitch by means of machinery—its characteristics being as follows:—

First, That there are, at certain periods in the formation of the seam, two loops of needle thread below the cloth at the same time, one being extended and the other drawn up, substantially in the manner and for the purposes specified, and

Second, That the stitch is tightened or drawn up by the extension of the next succeeding loop, as distinguished from a drawing-up of the stitch by the motion of the needle or needle bar.

Obed Hussey, of Baltimore, Md, for an Improvement in Reaping Machines. Patented Aug. 7, 1847; re-issued April 14, 1857; again re-issued June, 21, 1859:

I claim the combination of the finger beam (without a platform) the short, open slot fingers having small projections below the cutter, the scolloped cutter, and the guides for the cutter; these parts being constructed and combined substantially as described, the cutter vibrating in a straight line, each scollop having an edge sliding in close proximity to an angular corner of the finger and forming therewith a nipping angle substantially as described.

P. H. Roots, of Connersville, Ind., for an Improved Water Wheel. Patented March 15, 1859:

I claim the wheel, A, and rotating breast or abutment, E, moving with different degrees of velocity, in combination with the apron or concave, D; the whole being arranged to operate as and for the purpose specified.

ADDITIONAL IMPROVEMENTS.

Thomas P. Costello, of Buffalo, N. Y., for an Improvement in Skate Fastenings. Patented Dec. 16, 1859:

I claim the employment or use of a lateral screw or bolt, O', Fig. No. 1, running horizontally through a horizontal socket, o, Fig. No. 3, the upright bolt, c', Fig. C No. 2, and socket, a, Fig. No. 1, arranged as shown in the manner and for the purposes set forth; and a plug or bolt, C, Fig. No. 5, to be put in a socket, a, Fig. No. 1, after the runner is removed and fastened herein, for the purposes set forth as described.

Washburn Race, of Seneca Falls, N. Y., for an Improvement in Pump Packings. Patented Nov. 24, 1859:

I claim employing the piece, G', in combination with the packing leather, and with a groove or recess in the bridge, D, to hold the valves, E, in place and form a packing for the oscillating shaft, B, substantially in the manner and for the purposes set forth.

DESIGNS.

Elemir J. Ney, assignor to the Lowell Manufacturing Company, of Lowell, Mass., for a Design for Carpet Patterns (2 cases).

Notes & Queries

To CORRESPONDENTS.—The sum of 25 cents will be paid for one copy of each of the following numbers or the SCIENTIFIC AMERICAN, if addressed to W. T., at this office:—Vol. I.—Nos. 11, 13, 20, 22, 30, 34, 41; Vol. II.—Nos. 1 to 11; Vol. III.—No. 18; Vol. IV.—Nos. 13, 25; Vol. V.—Nos. 16, 17, 21, 48; Vol. VI.—Nos. 27, 46; Vol. VII.—No. 38, Vol. XII.—Nos. 12, 13, 18, 28, 34.

A. T. L., of Ga.—In making electrotype deposits from copper, the impression is first made upon wax by pressure, which converts it into the mold. The face of the wax is now brushed over with black lead, and it is upon this that the copper is deposited. Wax being non-conducting, no deposition of metal will take place upon it; hence the necessity for coating it with plumbago. Glass is printed upon with colors by blocks, the colors being of an adhesive resinous character; and, by being mixed with proper varnishes, they can be made either transparent or opaque.

J. T. E., of N. Y., and J. C. P., of Mich.—You will see that the subject of your letters is disposed of in our last number.

A. G., of N. Y.—India-rubber boots are mended with a cement made of the same material. It is kept for sale by dealers generally in rubber goods. The parts are coated with the cement and pressed together with great force for a considerable time.

C. J. S., of Pa.—Your copper ore from Columbia county, Pa., is received. It is the sulphuret of copper mixed with a large quantity of the sulphuret of iron in a quartz matrix.

J. H. McD., of N. Y.—The ordinary solution for plating brass is cyanide of silver. You can make it by dissolving the chloride of silver in a solution of the cyanide of potash. A Smee's battery is necessary for you to deposit the metal. The brass must be perfectly clean before you put it in the solution or it will not receive the deposition.

L. W., of Mass.—A shoe-brake to be thrown under the wheel of a railroad car is not new, but we have never known of one being operated by a galvanic battery. Electro-magnetic brakes, to operate on the same principle, have been proposed to us; but we think they are not so practicable as those operated in the common way by a lever or spring.

S. C. S., of Mass.—An hour's instruction in an electrotype foundry would be worth more to you than a whole volume written on the subject. Smee's "Electro-metallurgy," published by J. Wylie, No. 56 Walker-street, this city, is the most thorough and instructive work for you to purchase for obtaining a knowledge of the art.

A. D. C., of Mass.—An alloy composed of 53 parts copper (by weight), 17 nickel and 13 zinc, makes a very good imitation of German silver. Another white alloy is composed of 20 parts copper and 80 parts Banca tin. You must be very careful in casting it, so as to permit the air to escape from the molds when the molten metal is poured in; because if the air is not permitted to escape freely, the casting will be full of blisters.

G. W. C., of Mich.—You will see by our answers to H. D. B. and A. C. C. that your explanation of the apparent coolness of a boiling pot is the same as that which we have given.

L. S. F., of Mass.—You will find a published list of the coal oil companies in the United States on page 3 of the present volume of the SCIENTIFIC AMERICAN.

E. L., of Va.—We believe Lord Brougham has edited Newton's Fluxionary Calculus, which is the same in nature as Liebnitz's Differential Calculus. If you will write to C. S. Francis & Co., No. 554 Broadway, this city, you can learn about the work, its price, &c.

C. M. F., of Maine.—The wages of machinists both in New York and Philadelphia vary very much with the capacity and skillfulness of the workmen. The average may be about $1.75 per day.

E. C. F., of N. Y.—You can easily coat a polished steel surface with a thin scale of copper by dipping it in a solution of sulphate, and upon the top of this you can gild or plate with silver. You can purchase silver-plated steel knives and forks in any of our silverware stores.

G. W. S., of Pa.—The draw plates for the finer kinds of copper wire are made in Germany. The plates are composed of the best hardened steel. We do not know where you can obtain a special treatise on the manufacture of wire.

J. S., of Geo.—If you have a cauldron sufficiently large to boil the iron work of your mill in a strong solution of soap suds for one hour, we believe you will remove the rust on it. By the use of dilute sulphuric acid the same results will be effected. We have seen many brick vats lined with hydraulic cement employed for tanning hides. A composition composed of equal parts of asphalt and coal tar, boiled together for two hours and mixed with chalk and gravel, will make a roofing cement that will last for ten years at least. It should be laid on the top of thick paper and covered on the surface with fine sand and gravel.

A. B., of Mass.—A strong solution of isinglass is the best cement you can use for broken mother-of-pearl.

L. S. V., of Tenn.—We are not acquainted with any glutinous cement that possesses the remarkable properties which you require, namely, fire and water proof. Plaster-of-paris may answer your purpose, but it is not very adhesive. Good copal varnish may also answer your purpose. It will stand a pretty high temperature, dries fast, is waterproof, and very adhesive.

G. R., of Iowa.—Every turbine, to operate in the best manner, must have the curve of its bucket graduated to the head of water. Skillful builders of such wheels construct them for the special heads under which they are to act. Most millers in this section prefer burr stones of 4½ to those of 3 feet diameter.

J. H. T., of Pa.—You will find full information on the strength of hollow cast iron pillars in the works of Professor Hodgkinson on the strength of iron.

S. F. C., of Md.—There is no work in print—of the character you have described—on sawmills. Several good shingle and stave machines have been illustrated in former volumes of the SCIENTIFIC AMERICAN. Write to the owners of them for the information you desire. We will consider your other requests.

J. H. K., of N. Y.—To make a cement for architectural purposes, such as interior moldings, take paper pulp and plaster-of-paris, and make it into a proper consistency with fine glue and a little shellac varnish. It must be used very soon after it is made, because it becomes hard in two hours. You can color it brown with paint. Fine mahogany saw-dust, mixed with glue, plaster-of-paris and a little shellac, also makes a good cement for artificial wood moldings. These will not stand exposure to the weather, but will endure for many years when kept in a dry situation. The address of E. Howe, Jr., is 447 Broome-street, this city.

H. D. B., of Vt.—We doubt the correctness of the statement that "a shingle block sawed from a tree which has its grain winding from right to left will rive out flat shingles, while one that winds from left to right will rive winding shingles." Observe more closely such cases hereafter. The winding and flat shingles in these cases may have been due to some other peculiarity in the logs than those which you have stated. We admit that there are many mysteries in nature which puzzle us at every step but there are no contradictions in the operation of natural laws, Copper kettles are generally thinner than those of iron; and this may account for the one being held longer in the hand, when containing boiling water, than the other.

J. C. M., of Mass.—The best and cheapest substance which you can use for washing cotton waste is caustic lye. Take 10 lbs. of freshslacked lime and an equal weight of sal soda; dissolve the latter in boiling water, then mix the lime and the dissolved soda in 100 gallons of cold water. Now stir up all together and allow it to stand for five hours, when a white sediment will fall to the bottom, and the clear liquor will be the caustic lye for washing the waste. It will also be useful for softening hard water and washing clothes, wool, &c.

A. C. C., of N. Y.—We have tried the experiment of holding the hand on the bottom of a kettle of boiling water, and though the hand was not burned, we are of opinion that the temperature was just about that of boiling water. We attribute the exemption from burning to the fact that the hand does not come in very close contact with the kettle. If one's hand is thrust into boiling water, the water enters every pore, and touches every particle of the skin, imparting its heat at every point; but the bottom of a kettle being covered with rough soot, only a few points touch the hand, and the little heat which is conveyed by these is absorbed in evaporating the natural moisture of the hand.

INQUIRER, of Conn.—The nature of the effect of carbon on iron, when combined with it to form steel, has been extensively discussed, but it is in fact not at all understood. One of the most curious things in nature is the difference in properties possessed by carbon in its different states of diamond, plumbago and charcoal. It has just been discovered that its atomic weight even varies in its different states; or rather the statement of such a discovery has been published.

P. & H., of Fla.—You state that the two central boilers of your gang of four have a better draft than the others, and make steam faster, thereby increasing the pressure in them, which drives out the water into the two others. Owing to this action you believe the water sometimes gets too low in your central boilers, and that from that cause you have had three explosions during the last six years. You can easily prevent this by having all the steam spaces of the boilers so connected that the steam pressure will be equal in them all. In all likelihood your steam pipe connection are too small.

A. K. R., of Ohio.—If you have the knowledge of chemistry usually acquired in our best medical colleges, a few months' teaching by a practical analytical chemist would enable you to analyze soils. Professor B. Silliman, Jr., of New Haven, Conn., has a good reputation in this department.

J. G. H., of C. W.—We do not see any marked improvement in your rotary steam engine which would distinguish it as a better plan than some others. It belongs to a doubtful class of inventions

A. P. T., of Ga.—We shall endeavor to publish the time and place of holding the various fairs during the year. We cannot inform you when the decimal statistics will be due to the public. You had better write to your member of Congress upon the subject.

B. R., of Ohio.—If you boil your rancid butter for about ten minutes with an ounce of saleratus added to every five pounds of butter, its rancidity will be removed after it becomes cool, but it will not have the taste of good fresh butter. A sediment falls to the bottom containing casein.

G. S. W., of Mich.—The best cement known to us for uniting surfaces of leather together is a strong solution of isinglass. A cement composed of dissolved india-rubber and lac-varnish is also very adhesive, and may answer your purpose best.

L. G. S., of Pa.—You will find in Lardner's work on light and sound an acoount of the experiments which are believed to prove that two sounds produce silence, and that two rays of light produce darkness. The former inference we are not disposed to question, but the latter was never entirely satisfactory to our minds.

W. C. B., of Ill.—You ask an explanation of your ability to move a small table with your hand resting upon it, without effort. There are two kinds of muscles in the human body, the voluntary and the involuntary, the former of which generally act in obedience to the will, while the latter are not subject to the control of the will. The muscles of the heart, lungs, stomach, and other viscera, are involuntary. In various abnormal conditions of the system, the will loses its power over the voluntary muscles, when they act or cease to act without any regard to its dictates. This is not a strange nor unusual event, but is very frequently occurring with the great mass of people. One of the most common causes of the mysterious and wonderful connection between the will and the muscle being interrupted, is either a constrained or a long-continued position of a limb; we suppose this occurred in your case, and your muscles, as they have doubtless done a thousand times before, contracted without any conscious effort of your will. Your hand stuck to the table probably by the adhesive property of perspiration. At this moment our knife is supported, by this property, against the palm of our hand, in an obliquely-perpendicular position.

Money Received

At the Scientific American Office on account of Patent Office business, for the week ending Saturday, March 3, 1860:—

L. S., of Pa., $25; J. T. F., of Ky., $30; J. F., of Mass., $10; R. F. O'B., of Mo., $30; I. N. W.. of Ill., $30; S. S. R., of Cal., $30; J. L., of N. Y., $32; T. M., of Conn., $30; A. B. H., of Fla., $27, N. Q. M., of Wis., $30; C. & L., of N. J., $40; A. H., of Ohio, $25; J. L. H., of Conn., $25; C. J. S., of S. C., $30; S. McQ., of Ill., $32; A. S., of N. Y., $30; R. H., of Mass., $25; W. & D., of Mass., $30; W. & C., of N. Y., $50; T. W., of R. I., $20; S. M., of Va., $30; O. C., of Vt., $25; D. McK., of L. I., $35; C. A. D., of Miss., $70; J. M., of Ill., $30; B. & L., of N. Y., $30; C. K., of N. Y., $12; W. M. B., of Ind., $55; H. L. C., of Tenn., $25; J. P. F., of N. J., $30; A. H., of Ky., $30; T. B. McC., of Del., $25; H. E. and others, of Pa., $25; H. & S., of R. I., $100; A. L., of N. Y., $30; M. R. L., of Miss., $25; D. P. F., of Wis., $25; R. N., of Ga., $30; C. C. F., of Conn., $250; S. R. S., of Mich., $25; C. E. S., of Wis., $20; S. A. C., of Mass., $30; T. H. McC., of Ill., $25; J. L. B., of N. C., $30; A. M. S., of Mass., $20; J. M. S., of Ind., $25; J. S., of L. I., $20; N. H. H., of Wis., $10; J. P. W., of Ky., $30; J. M. W., of N. Y., $30; G. H. C., of S. C., $25; D. & S., of N. Y., $30; H. K., of Ill., $30; J. H. D., of Conn., $25; C. W., of Mass., $10: D. W. A., of Ill., $10; C. K., of N. Y., $20; W. C. M., of ——, $32; W. T. L., of Mass., $25; W. O. P., of N. Y., $25; O. L. R., of Ga., $30; G. M., of Vt., $10; G. W. B., of Conn., $25; S. J., of Fla., $30; G. W. T., of N. Y., $30; J. H., of Wis., $10; F. D., of Conn., $25; S. D., Jr., of S. C., $25; J. H. W., of N. J., $32; W. H., of Ohio, $30; M. S. B., of N. Y., $25; S. D. C., of N, Y., $25; W. H. S., of R. I., $55; A. J. G., of Mass., $30; G. W. S., of Conn., $40.

Specifications, drawings and models belonging to parties with the following initials have been forwarded to the Patent Office during the week ending Saturday, March 3, 1860:—

C. A., of Ill.; O. S., Jr., of Iowa; C. K., of N. Y.; G. H. C., of S. C.; H. E. and others, of Pa.; B. A. J., of Mo.; W. O. P., of N. Y.; M. C. M., of N. Y.; C. A. D., of La.; W. H. S., of R. I.; G. W. B., of Conn.; F. D., of Conn.. T. H. McC., of Ill.; L. S., of Pa.; W. S., of ——; A. H., of Md.; T. H. W. & Bro., of Ga.; W. T. L., of Mass.; T. & R., of N. H.; M. R. L., of Miss.; J. L. H., of Conn.; A. H., of Ill.; L. R. S., of Mich.; S. D., Jr., of S. C.; J. M. S., of Ind.; D. M. S., of Vt.; S. M., of N. Y.; J. H. D., of Conn.; C. & L., of N. Y.; H. L. C., of Tenn.; D. L. M., of N. J.; T. B. McC., of Del.; D. P. F., of Wis.; A. H., of Ohio; M. L. B., of N. Y.; G. W. R., of N. Y.; W. H. McN., of N. Y.; G. W. S., of Conn.; J. S., of N. Y.; O. C., of Vt.; S. D. C., of N. Y.

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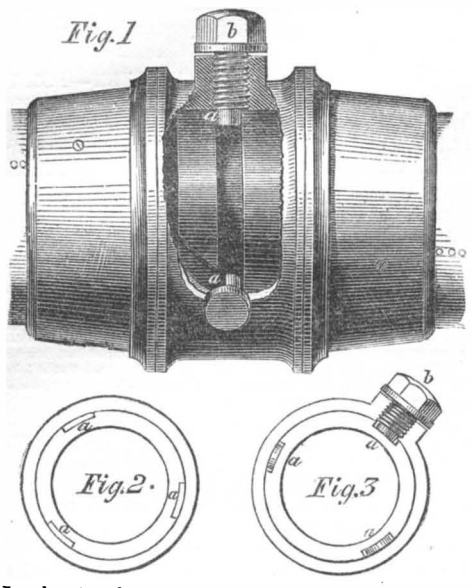
SMITH'S HOSE COUPLING.

A few months ago, it was reported that an inventor in Newport, R. I., had been offered $20,000 for an improved plan for a hose coupling, and this report seems to be stimulating other persons in the same place to make inventions in the same line. The annexed cut represents a device for coupling hose, which seems to be about as simple as anything can be, and to form a smooth and secure joint.

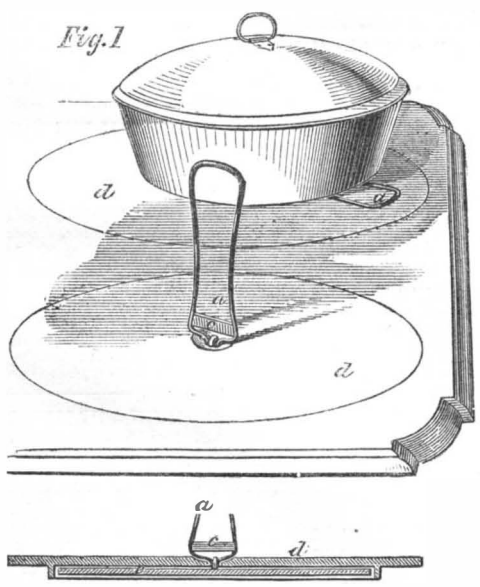


In the female screw are made three spiral grooves, *a a a*, with three corresponding stops or studs in the male screw, one of which stops, *b*, consists of a screw passing through the coupling, and furnished with an octagonal head on the outside. The use of this screw is to prevent the coupling from turning and becoming disjointed, and its thread is cut in the proper direction to turn the coupling, so as to tighten it when the screw is turned inward, and to loosen the coupling when the screw is turned outward. An elastic packing is interposed between the end of the male screw and the female screw where they meet, and it requires only about one quarter of a turn to bring these parts together.

The patent for this invention was issued Aug. 30, 1859, and persons desiring further information in relation to it may address the inventor, Wm. H. Smith, at Newport, R. I.

IMPROVED HANDLE FOR STOVE COVERS.

The stove is an article of such universal use that any real improvement in it is of very great value. The annexed cut represents a contrivance for the cover handles, which permits them to bend down freely under any vessel placed upon the stove, and restores them instantly to an upright position when the vessel is removed.



The handle, *a*, is made about four inches long, of No 12 wire, bent in the form represented, with a brace, *c*, across the lower part. Beneath the cover, *d*, is the circular plate, *e*, which acts as a weight to draw the handle into an upright position; the plate being connected with the handle by means of a staple, and the shoulder of the handle being so fashioned, in relation to the hole in the cover, that the latter may act as a fulcrum over which the handle turns as it is operated upon by the weight. As the handle turns freely in the circular hole it is bent down with perfect facility in any direction; and when it returns to its place on the removal of the vessel, it is always ready to be grasped by the hand for removing the cover.

The inventor states that this convenient device has been in use for two-and-a-half years without any perceptible wear, and that the handle never becomes too warm for the hand with an ordinary fire in the stove.

The patent for this invention was granted (through the Scientific American Patent Agency), on Sept. 13, 1859, to J. H. Gould, who has assigned it to himself and E. N. Hartshorn; and persons desiring further information in relation to the matter, will please address Gould & Hartshorn, at Alliance, Ohio.

IMPROVED NOZZLE FOR HOSE PIPE.

When fires occur in low buildings it is desirable to play upon them with a large stream of water, but in the case of high buildings a smaller stream must be employed, as it can be thrown higher with the same power than a large one. When there is occasion to change the size of the stream during the progress of the fire, it has heretofore been necessary to unscrew one pipe, and replace it by another of a different size, consuming time just when every minute is of immeasurable value.

The contrivance which we here illustrate is intended to obviate the changing of the pipes, while the result obtained is the same. It consists in having three nozzles

of different sizes fastened to a revolving plate eccentric to the end of the pipe, so that by simply turning the plate, either of the nozzles may be brought over the end of the pipe. The revolving plate, *a*, is shown in the cut with the nozzles attached. This plate is circular, and of the same size as the disk, *c*, which is fastened to the end of the pipe. It has a shoulder turned in its edge, over which the ring cap, *d*, fits loosely, this ring being screwed upon the disk, *c*, to hold the parts together. The plate, *a*, and disk, *c*, are ground together with emery so as to fit water-tight together, and still to allow of an easy motion of the plate over the disk. The pin, *e*, which is pressed upward by a spiral spring, enters one of three holes fitted for it in the proper plate, *a*, to hold either of the nozzles in line with the pipe; this pin is drawn down when the plate is to be turned.

The patent for this invention was issued to A. W. Roberts, May 8, 1855, and has been assigned to John C. Dickinson, to whom inquiries for further information may be addressed at Owego, N. Y.

HUMAN ENDURANCE.—During the Arctic voyages in search of Sir John Franklin, it was ascertained what a seaman can do in the way of traveling, carrying, and dragging. The maximum weight proper per man was ascertained to be 220 lbs., and of that weight, 3 lbs. per diem was consumed by each man for food and fuel—namely, 1 lb of bread, and 1 lb. of meat, while the other pound comprised his spirits, tea, cocoa, sugar, tobacco, and fuel for cooking. Upon this estimate it was found that, for a hundred days' journey, they could march ten miles per diem, and endure with impunity a temperature of 50° or 60° below the freezing point.

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3d, Have no faith in your own business, and be always ready to sell out.

4th, Buy mean cows, spavined horses, poor oxen, and cheap tools.

5th, Feed bog hay and mouldy corn stover exclusively, in order to keep your stock tame. Fiery cattle are terrible hard on old, rickety wagons and plows.

6th, Use the oil of walnut freely whenever your oxen need strength. It is cheaper than hay or meal, keeps the hair lively and pounds out all the grubs.

7th, Select such calves for stock as the butcher shuns; beauties of runts, thin in the hams, and pot-bellied, but be sure and keep their blood thin with scanty herbage. Animals are safest to breed from, that haven't strength to herd.

8th, Be cautious in the manufacture of manures. It makes the fields look black and mournful about planting time; besides it is a great deal of work to haul it.

9th, Never waste time in setting out fruit and shade trees. Fruit and leaves rotting around a place make it unhealthy.

The road to poor farming, though largely traveled, is not well understood, and these landmarks are thrown up for the common benefit.—*Springfield Republican.*

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